MACHINE TOOL BLUE BOOK



Where *Precision* Is A REQUIREMENT

IT'S A JOB FOR LINCOLN PARK

Special precision work such as that illustrated can always be handled most efficiently and economically when it is entrusted to men who *constantly* work to high precision standards.

Lincoln Park has a department devoted exclusively to special work. Here the experience of skilled gage makers and the facilities of one of the country's finest gage plants are combined to produce extremely accurate special gages, tools, dies, fixtures and parts. Let us show you how the services of this department can be used most advantageously by you.

ARMY E NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

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most VERSATILE

most CAPACITY

FASTEST



EACH *first* IN ITS CLASS

At the Braeburn Alloy Steel Corporation, Braeburn, Pennsylvania, there is a lot of steel to be cut—not only in tonnage but in types of steels, variety of cuts and range of sizes. Still the Braeburn Corporation can give prompt cutting-off service on any order, whether it be for a single tool steel flat, a thousand gear blanks or a giant die block (up to 18" x 18" cross section). They have equipped their cutting-off department to handle every type cutting-off job with a MARVEL No. 8 Metal-cutting Band Saw, by far the most versatile saw built; a MARVEL No. 9A Automatic Production Saw, by far the fastest saw; and, a MARVEL No. 15 Giant Hydraulic Saw—which, with the exception of its larger "sister" the MARVEL No. 24 (capacity 24" x 24"), is the largest capacity hack saw built. With this battery of modern sawing equipment this firm gets the utmost in Speed, Accuracy and Economy, no matter what the job calls for. Furthermore, because of the automatic features of these saws, one operator takes care of all 3 of them.



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For quick reference see our section in Sweet's File—Mechanical Industries or write for catalog.

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Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

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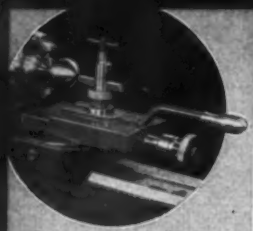
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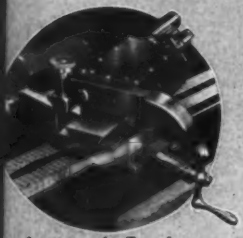
918 PLAIN CABINET LATHE

For

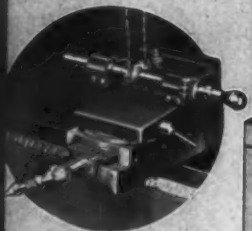
Tool-room—Assembly—Production



Spherical Turning



Automatic Turning



Universal Grinding

The Rivett No. 918 plain cabinet lathe is a versatile machine capable of many operations. In addition to the normal lathe functions of turning, facing, boring and drilling, the 918 can be equipped for milling, grinding, slotting and thread chasing.

The operating conveniences and design features assure efficiency on any operation. Work can be quickly gripped in collet or step chuck or mounted on centers or face plate. Selected spindle speeds are controlled by single lever. Built-in accuracy, correct spindle speed and dynamic balance guarantee finish to closest tolerance.

The machining capacity and producing efficiency of the 918 plain cabinet lathe open many opportunities for its use in the tool-room, assembly and production departments.

Write for bulletin.



SPECIFICATIONS

ng over bed, dia.	9"
nce between centers	18"
et capacity, max. dia.	1"
chuck capacity, max. dia.	6"
chuck capacity, max. dia.	6"
dle capacity, max. dia.	1⅛"
rest, travel of tool post slide	5¼"
rest, travel of cross slide	5¼"
tock spindle travel	3½"
dle speeds, eight forward and reverse.	
w range	150-2500 r.p.m.
gh range	225-3750 r.p.m.
ght of lathe, mounting and drive,	net 850 lbs.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

HARDINGE
ELMIRA, N.Y.

ANNOUNCING A NEW MODEL

HIGH SPEED PRECISION
SECOND OPERATION MACHINE



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FEATURING:

- Hardened and Ground Steel Dovetail Bed Ways
- Three Point Bed Mounting
- Center Drive Preloaded Ball Bearing Spindle
- Hardened and Ground Steel Ways in Turret
- Preloaded Ball Bearing Turret Head
- Complete Built-in Electrical Equipment

Write for Bulletin DSM 59

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1" Collet Capacity — 9" Swing

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

ARMSTRONG



100-150 f.p.m. 200-300 f.p.m. 300-600 f.p.m.

Whatever the Cutting Speed . . .



ARMSTRONG TURNING TOOLS for High Speed Bits



ARMSTRONG CA Tool Holders for ARMALOY Bits



ARMSTRONG Tool Holders for ARMIDE Cutters

Whatever cutting speed an operation calls for, there is a correct ARMSTRONG TOOL HOLDER that takes the proper bits, blades or cutter to do the operation economically and efficiently.

ARMSTRONG HIGH SPEED

For general tool room and machine shop use, ARMSTRONG HIGH SPEED Bits and Blades are unsurpassed. They will stand up to speeds and feeds far greater than those generally accepted as "standard".

ARMALOY

ARMALOY Bits and their corresponding ARMSTRONG CA TOOL HOLDERS are recommended for machining sand-filled castings, malleable iron, non-ferrous metals, rubber, plastics and for machining steel on modern high production machines, where sufficient speed and feed can be obtained to take advantage of their greater cutting capacity.

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ARMIDE Carbide-Tipped Cutters and ARMSTRONG Carbide Tool Holders, make the use of Carbide-tipped tools practical in even the smallest shop. Coming in two grades ARMIDE Red (for steel) and ARMIDE Gray (for cast iron, brass, aluminum and non-ferrous materials). They easily machine hard and tough steels, and stand up to the highest speeds and heaviest feeds, and increase the interval between tool re-grindings as much as 10 to 50 times.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

308 N. Francisco Avenue **Chicago 12, U.S.A.**

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1275 Mission St., San Francisco 3, Calif.

Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago 5

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NOVEMBER 1945

Featured in This Issue - 136
Editor's Page - 138
The Art of Metal Cutting - 141
Turning Steel with Negative Rakes - 155
By Carroll Edgar
Recent Progress in Milling Machine Operations - 167
By C. W. Hinman
Belt Drive Designs - 183
By John E. Hyler
27th National Metal Show - 190
Looking Ahead - 192
By Geo. S. Benson
Trends on the Production Front - 199
Versatility of the Ball - 217
By H. F. Williams
The Engineering of Manual Marking Devices - 233
By C. O. Malmstrom
The Foremanship Forum - 265
By Edmund Mottershead
Electronic Air Cleaners - 285
By Francis A. Westbrook, M.E.
Types of Resistance Welding Work - 301
By F. R. Woodward
"Let's Talk Shop" - 330
What's New in Metal Working - 342
An Unusual Threading Job - 412
By Gerald Eldridge Stedman
Mechanics Through the Ages - 434
Advertiser's Products Index - 440
Index to Advertisers - 446-450

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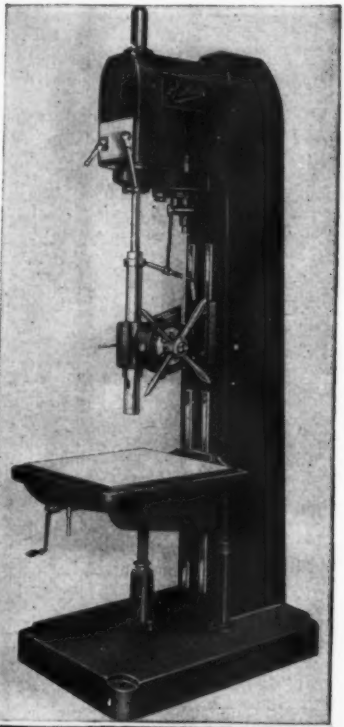
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You can change drilling speeds *instantly* . . . at the touch of a finger . . . while actually drilling. You have "101 speeds" for your instant selection. You have a big, husky drilling machine, for holes up to 1¼ inch, with accuracy enough for tool room work.

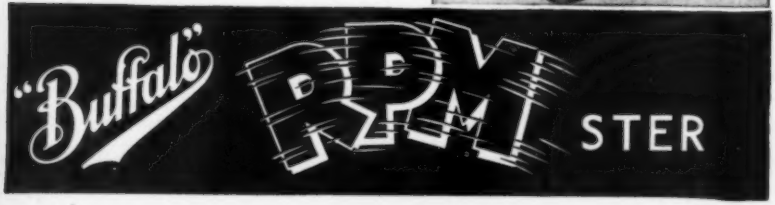
And — you have a drill which has demonstrated its rugged ability in hundreds of plants on twenty-four hour shifts for the past four years.

Get all the facts about the "RPMster" and you'll buy it! Ask for Bulletin 3257.



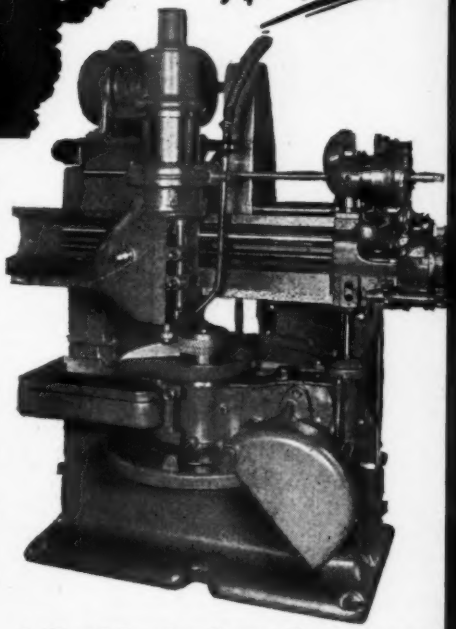
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161 Mortimer St. Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



THE ONE-MACHINE GEAR SHOP

Ready for Anything



The All-Purpose Fellows 6-Type Gear Shaper is a Machine with which you can:

- ✓ CUT A WHOLE RANGE OF GEARS OF GIVEN PITCH WITH 1 CUTTER
- ✓ CUT INTERNAL AS WELL AS EXTERNAL GEAR TEETH
- ✓ CUT A HERRINGBONE GEAR WHEN REQUIRED
- ✓ CUT GEARS TO RUN AT "OFF-STANDARD" CENTER DISTANCES
- ✓ CUT A KEYWAY OR INTERNAL OR EXTERNAL SPLINES
- ✓ CUT CLUSTER AND SHOULDER GEARS WHEN REQUIRED
- ✓ CUT CHAIN SPROCKETS, RATCHET TEETH OR SPECIAL SHAPES
- ✓ DUPLICATE A NON-STANDARD GEAR EVEN INDEXING BY HAND IF NEED BE
- ✓ DISK AN INTERNAL—OR EXTERNAL BLANK IF NO OTHER MEANS ARE AVAILABLE

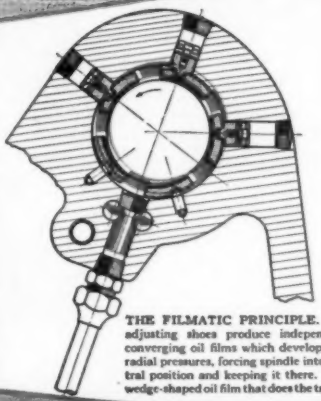
A 6-Type Fellows Gear Shaper will equip you to cut gear teeth or special contours on external work up to 35 inches diameter, and internal work up to 24 inches diameter . . . The machine's versatility is beyond comparison. Ask for a descriptive circular and renew your acquaintance.

THE **FELLOWS** GEAR SHAPER COMPANY

78 River St., Springfield, Vermont — 640 West Town Office Bldg., Chicago 12, Illinois — 616 Fisher Bldg., Detroit 2, Mich.

FILMATIC

STOPS "PECKING OF THE DIAMOND"



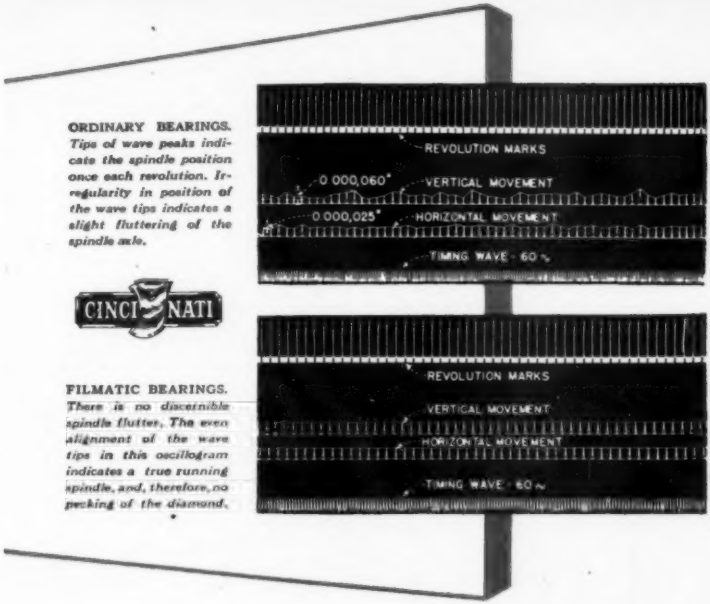
THE FILMATIC PRINCIPLE. Self-adjusting shoes produce independent, converging oil films which develop high radial pressures, forcing spindle into central position and keeping it there. "The wedge-shaped oil film that does the trick."



In this illustration a CINCINNATI Plain Self-Contained Grinder is finish grinding the outside diameter of a printing press cylinder. Catalog G-491-1 contains complete specifications for this machine. Sweet's Catalog File for Mechanical Industries gives a brief description of CINCINNATI Grinding Machines.

CINCINNATI

CENTER TYPE GRINDING MACHINES



ORDINARY BEARINGS. *Tips of wave peaks indicate the spindle position once each revolution. Irregularity in position of the wave tips indicates a slight fluttering of the spindle axis.*

FILMATIC BEARINGS. *There is no discernible spindle flutter. The even alignment of the wave tips in this oscillogram indicates a true running spindle, and, therefore, no pecking of the diamond.*

When truing the grinding wheel, the slightest wavering of the spindle causes the diamond to "peck" at the wheel as it travels across the surface, rather than to maintain a smooth, even pressure during the truing operation. On CINCINNATI Grinders the elimination of "diamond pecking" is a reality because FILMATIC Bearings assure a true running spindle, and no flutter means a smoothly trued wheel. The sound of truing a grinding wheel supported by FILMATIC Bearings is like that of tearing fine silk cloth—it's smooth and even. ¶ This, then, is still another advantage in using CINCINNATI Centerless or Centertype Grinders with FILMATIC Bearings because a wheel trued on these machines is sure to produce a higher grade finish without any extra effort or skill on the part of the operator. The facts about this bearing and its advantages are contained in a fully illustrated booklet No. G-446. Write for your copy today.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES



CAST PLASTIC SEPARATOR MASKS

● Instead of replacing a lost punching die which had been used for making spray form caps required for separating parts during painting and baking, one manufacturer cast the caps or separators in a Durez liquid phenolic casting resin.

MOLD SIMPLE TO MAKE

A mold into which the resin could be poured had to be made first. This was easily achieved by the simple expedient of using one of the original caps as a model and pouring the Durez casting resin around it. Since close tolerances were not required, a chrome-plated steel plug was eye-centered in this mold and new caps were made from the casting resin quickly and easily. Wax was used as the parting agent.

SUBJECTED TO 350°F.

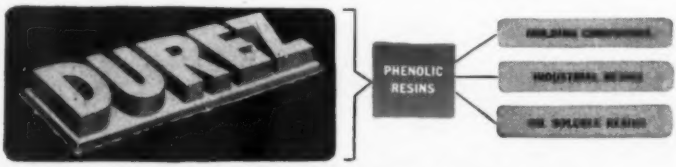
These cast plastic separator masks are subjected to 350°F. in an oven daily, for short periods. Caps which have been through the oven for more than 1000 hours show no evidence of deterioration. The manufacturer further reports that fewer rejects have been encountered since using the new plastic separator masks. Naturally, this means that production was increased on the one hand, with the cost of sprayed and baked parts decreased on the other.

OTHER USES FOR CAST RESINS

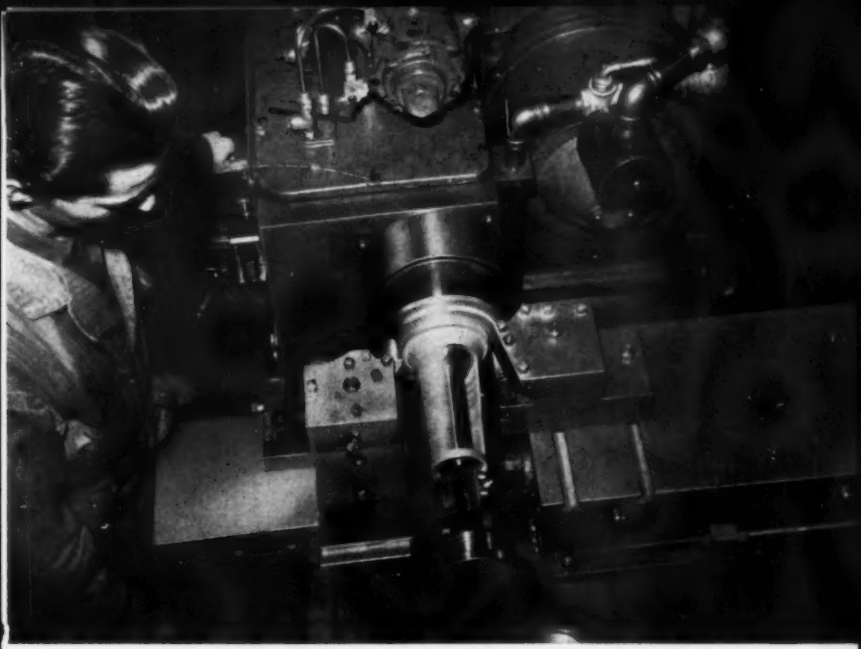
A few other time- and cost-saving uses for these remarkable resins are hydropress and stretchpress dies, jigs, assembly and holding fixtures, foundry patterns, and masking shields for plating.

AUTHORITATIVE FOLDER AVAILABLE

A technical booklet giving valuable detailed information about Durez casting resins is available free. No obligation, of course. Durez Plastics & Chemicals, Inc., 6011 Walck Road, N. Tonawanda, N. Y. *Export Agents — Omni Products Corporation, 40 East 34th Street, New York 16, N. Y.*



PLASTICS THAT FIT THE JOB



DOUBLE DUTY

WITH THE GISHOLT HYDRAULIC AUTOMATIC LATHE

ACTUALLY "double duty" is ultra-conservative for the production ability of this automatic lathe. For it can out-produce two, three, or even four manually operated machines wherever parts are to be turned out in large quantities.

What's more, its operation is so simple that one man, or woman, can tend two or three machines at a time. With but one small lever to control a whole cycle of operations, the training problem is practically eliminated. It's designed to handle a wide variety of between-centers and chucking work with high speed multiple cutting and extreme accuracy. If you can use this kind of production—to save man-power and cut costs—now and in the post-war period—ask for facts about the Gisholt Hydraulic Automatic Lathe.



GISHOLT MACHINE COMPANY

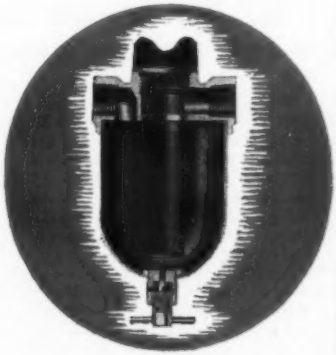
1185 East Washington Ave. • Madison 3, Wis.

Look Ahead...
Keep Ahead... With Gisholt
Improvements in Metal Turning

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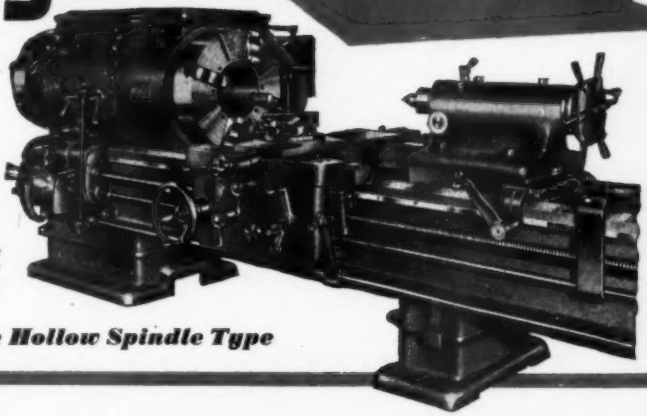
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Norgren

Do Important Machining Jobs in 1/2 to 1/7 the Time!

on a

Hydratrol Lathe



30" Heavy Duty Lathe with 13" Hole in Spindle

Large Hollow Spindle Type

Yes, in a number of plants important operations are being performed in 1/2 to 1/7th the time of previous operations. In one plant, Large Hollow Spindle Type of HYDRATROL LATHES are saving 15,000 man hours per month! Why not let us show you what a HYDRATROL LATHE could do in your plant?

5 SIZES – 18" to 36"

Small . . 18" up to 7¼" Hole Large 30" up to 14" Hole
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Large . . 27" up to 13" Hole *(Standard Type lathes 16" to 36")*

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Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND ★ ST. LOUIS 3, MISSOURI

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PROTECT

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with IDEAL DUST COLLECTOR

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Over 100 Products To Help Machinery Serve You Better

NEW IDEAL Lathe CHUCKS

Independent and Universal Types

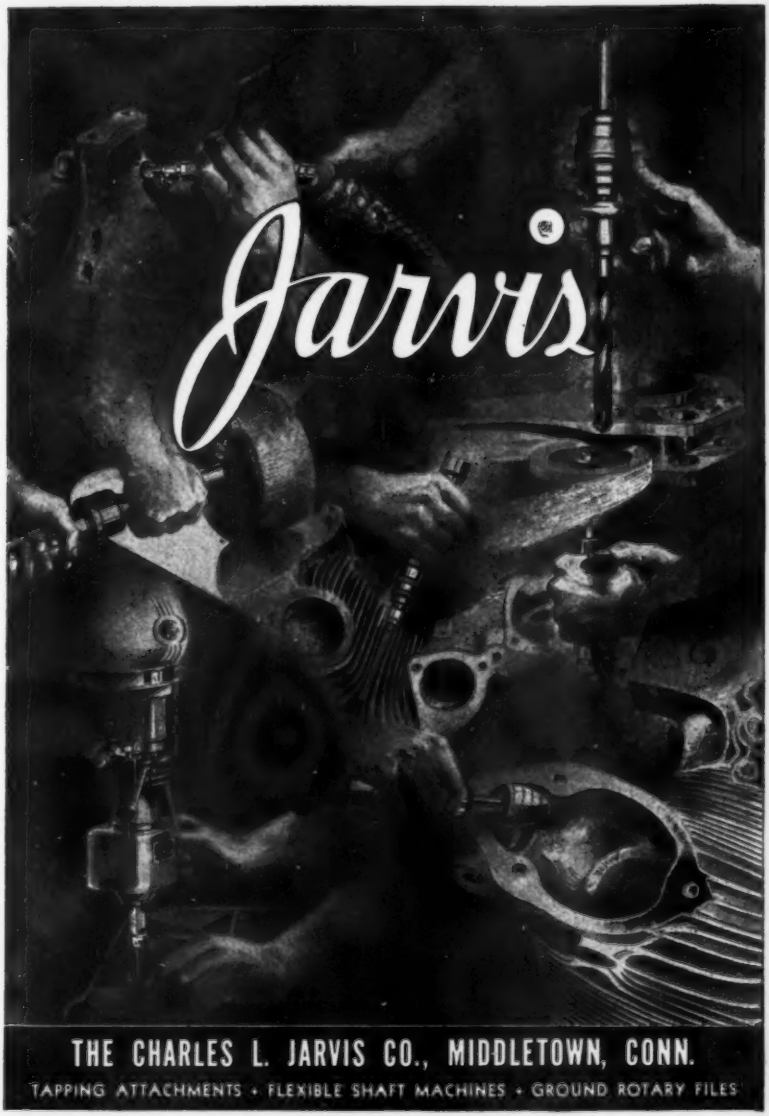
- Easily adaptable to any lathe.
- Jaws hardened and ground. 2 sets—Internal and External Type.
- Cast Adapter with each Chuck.
- LOW COST—High Precision.



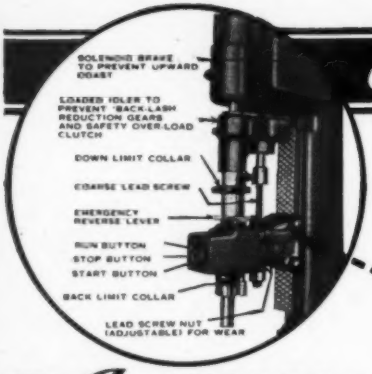
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Demagnetizers, Live Centers, Tachometers, Metal Etchers, Grinding Wheel Dressers, Balancing Ways, Granite Surface Plates.

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THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.
TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

Avey FEATURE No. 3



THE Avey TYPE MA-6
AVEY-MATIC POWER FEED HAND FEED AND REVERSING MOTOR TAPPING MACHINE

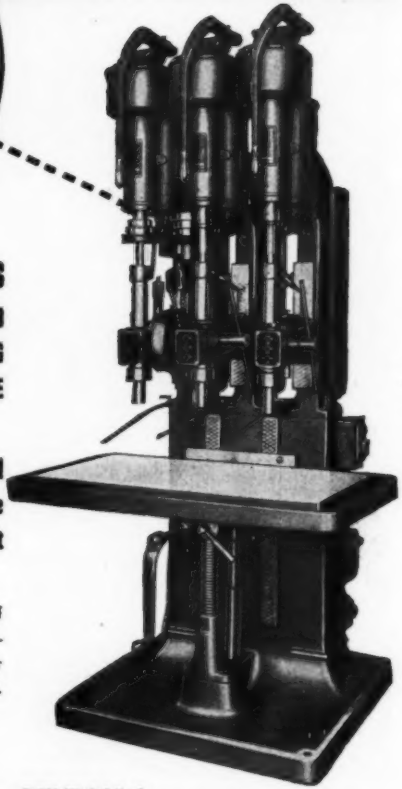
features

reversing motor, positive lead screw tapping — for accurate thread and tapping in soft material or thin sheets

Dog control for depth — maintaining accuracy of depth within one-half revolution of the spindle — or emergency relief lever used to reverse motor if necessary before tapping cycle is completed.

Type MA-6 is made in following capacities:
No. 2 — ⅜" capacity in cast iron.
No. 3 — 1¼" capacity in cast iron.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.



THREE SPINDLE No. 2
TYPE MA-6 • COMBINATION MACHINE
1st Spindle - Avey-matic Feed
2nd Spindle - Hand Feed
3rd Spindle - Tapping (Reversing Motor)

Avey



. . . THE VINCO SHOP EMPLOYEE . . .

whose skill and mechanical ability is reflected in the consistent high quality of Vinco products. He dotes on high precision work and is proud of the fact that he is one of an organization where mechanical exactness is treated with respect, and his skill and knowledge is improved by his constant association with men who are past masters in designing and building quality products.

These are a few of the many reasons why such products as the Vinco Optical Master Inspection Dividing Head, the Vinco Gear Rolling Inspection Fixture and the Vinco Spline and Gear Grinder are serving industry and meeting with its enthusiastic approval. The low percentage of rejections on production parts and gages is further evidence of Vinco manufacturing skill. Our satisfied customers are proof of our ability to serve.

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then they said to themselves

Boy!—did we build a business?



Recommended for niches in the Hall of Shame are the leaders of the House of Heil.

—All ideologists of the New Day.

—All fluent of tongue.

—All uttering words to dissuade men from honorable business tactics.

So their flourishing business came to the end of the road.

—recalling again the truth in the business advice of William Penn.

"False dealing travels a short road... true worth is inevitably discovered."

Timely precept, that. Many businesses will discover the true worth of techniques and equipment used in defeating the House of Heil . . . such as . . .



"True worth is inevitably discovered"...*he says*

LOOK, how to discover the true worth of an arc welding machine.

LOOK INSIDE...



Discover how the "SHIELD-ARC" WELDER cuts costs 15% to 20%

THE true worth of the "Shield-Arc" Welder is found in its ability to produce *better welds, faster, under all welding conditions.* Users report 15% to 20% lower welding costs with a "Shield-Arc" than with conventional arc welders. Look inside and discover why . . . such exclusive features as:

Dual Continuous Control ("Job Selector" and Current Control) provides precision adjustment of any TYPE or SIZE of arc to suit the job, for *highest welding speed at all times.*

Separate Excitation assures *fastest welding* under any and all conditions . . . at all current values.

Laminated Magnetic Circuit for quicker response of welder to arc demands . . . *for faster welding.*

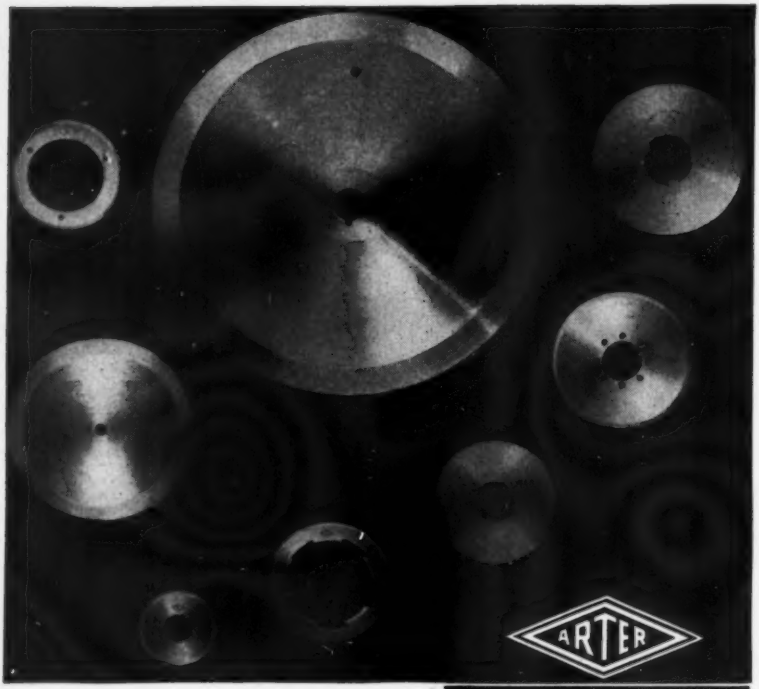
Self-Protected Motor assures positive and complete protection against motor burn-outs . . . allowing sustained operation at high amperage for *highest welding speed.*

31 "Shield-Arc" features are described in Bul. 412. Free on request.

THE LINCOLN ELECTRIC COMPANY • **DEPT. J-2** • **CLEVELAND 1, OHIO**

America's greatest natural **recourse**

ARC WELDING



The wide range of circular cutters with both single and double bevel cutting edges are ground to exacting requirements for parallelism, finish and thickness by Simonds Saw & Steel Company. These requirements are readily obtained by the versatile

ARTER

Rotary Surface Grinder



ARTER GRINDING MACHINE CO.

WORCESTER, MASSACHUSETTS • U. S. A.

15 minutes...

AS COMPARED WITH ½ a day!



PRECISION gages and pins are checked for "utmost accuracy" on a Jones & Lamson Pedestal Optical Comparator and Measuring Machine in less than one tenth of the time it formerly took to inspect them without a Comparator. They are inspected for Length, Depth, Outline, Angles, Straightness and Grooves. This Optical Comparator is also used for inspecting Form Tools, Threads and other Profiles.



Perhaps a Jones & Lamson Optical Comparator could effect comparable savings for you. Write for our book, "Beyond a Shadow of a Doubt." Or, better still, ask for one of our inspection engineers to call and discuss your inspection problems.

Photo courtesy of United Precision Products Company, Chicago, Illinois

JONES & LAMSON

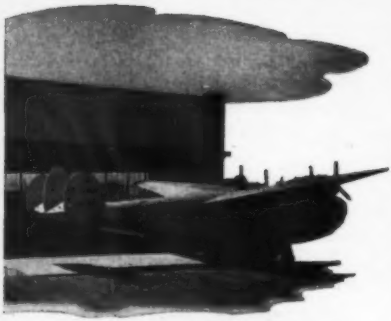
MACHINE COMPANY

Springfield, Vermont, U.S.A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.







Trans-Atlantic Clipper (built by Boeing) beached for servicing, La Guardia Field Hangers.

Pan American World Airways, at Marine Terminal—La Guardia Field, use, in almost constant service, a Hevi Duty 153012 Box Furnace to anneal aluminum alloy hull and wing pieces as well as miscellaneous steel assembly parts at temperatures ranging from 1000° to 1850° Fahrenheit. Flexibility of use of this furnace for many operations with accurate temperature control and heat distribution contributes largely to speedy round the clock servicing routine.

Send for Hevi Duty Box Furnace Bulletin HD-441

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI DUTY ELECTRIC EXCLUSIVELY

MILWAUKEE, WISCONSIN

midget IN SIZE — MIGHTY IN PERFORMANCE



New

IDEAL PNEUMATIC TOOLS

Now IDEAL, backed by a third-of-a-century experience, offers a new line of Pneumatic Tools —that present new standards in light weight, in compactness, in perfect balance, and in easy operation. This means *minimum fatigue* for beginner and experienced operator alike.

The new tools include—

The new *Air-Horse* Pneumatic Hammer; a cool working tool—impossible to overload. Many remarkable advantages and improvements too numerous to mention here are detailed in a Bulletin, which will be sent upon request.

The *Air-Horse* Pneumatic Die Grinder; designed as a tool post grinder for internal grinding, finish die grinding and similar work. Also has many uses in machine shops as a rotary file.

Light Weight Defeats Fatigue!

***Air-Horse* Riveting Hammers**

Three sizes—light, medium, and heavy impact. IDEAL'S lightest riveting hammer weighs only 2 lbs., 5 oz. and is only 5⅜" long. Specially designed and built for fast, effortless, high-production riveting. Two Handle Styles—Offset and Grip.

Air-Horse
Rotary File and Die Grinder

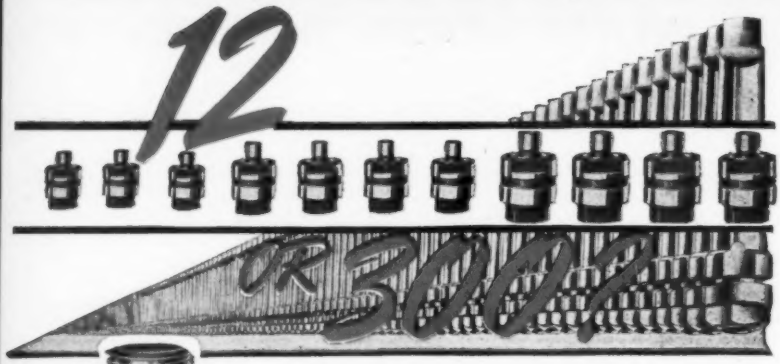
Weighs only 17 ounces, yet it is a high-speed, powerful, durable tool. Handles wheels up to 1½" diameter. Collet chuck for ¼" shank. Also sleeve collets for ⅛" or 3/16" shank. Operates at 25,000 r.p.m.

Write for Detailed Literature

IDEAL COMMUTATOR DRESSER CO.
1661 Park Ave., Sycamore, Ill.

IDEAL *Sycamore*

Branch offices in principal cities • Consult your local telephone book



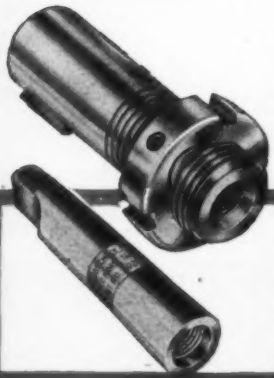


A UNIQUE DEVELOPEMENT IN CHUCK DESIGN THAT SAVES COST IN EQUIPMENT, TIME AND MANPOWER IN MODERN MANUFACTURING

Jacobs Production Chucks bring new standards of efficiency and economy in the operation of multiple spindle machines devoted to heavy duty drilling and reaming. Three outstanding advantages are gained in the use of these accurate, small diameter chucks:

1. Ability to handle an unusually wide range of drill sizes.
2. Extreme simplicity which features the Rubber-Flex Collet of one-piece construction ground as a unit after molding.
3. Ever-parallel jaw gripping surfaces that provide a tremendous hold on drill or reamer shanks.

The chuck socket receives the flatted tang of the drill and will take all drills having the same flat size. *On most applications,* because of the tenacious grip of the Rubber-Flex Collet, *standard drills can be used without danger of slippage.*



ADJUSTABLE ADAPTERS AND ARBORS

Jacobs Production Chucks have a male thread for mounting directly on the machine spindle or attaching to Morse Taper Arbors or Adjustable Adapters.

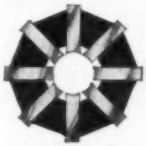
The Adjustable Adapter Assembly provides a quick, convenient means of compensating for variations in drill length. Adapters and Arbors are available in all popular sizes.



12 *Jacobs* PRODUCTION CHUCKS AND 3 ARBORS COVER MORE THAN 300 SINGLE PURPOSE CHUCK APPLICATIONS!



Inside faces of jaws comprise bore of collet.



At maximum capacity.



On large shanks, jaw-bites are always parallel.

featuring the Rubber-Flex Collet

"THE COLLET WITH A RANGE"

See how the new design and construction principle of the Rubber-Flex Collet can bring new efficiency and economy to your machine operations. The hardened alloy steel jaws are uniformly spaced and molded into an integral unit with a special compound of oil-resisting Neoprene.

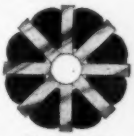
The action of the rubber is displacement, rather than compression. Under pressure it is displaced from its original shape, the volume of rubber between the jaws being the same as before force was applied. When the force is removed, it springs back to original shape, positively opening the jaws.

The jaws of the collet grip their full length and are always parallel throughout their entire range. This outstanding feature provides maximum gripping power and assures consistent, sustained accuracy.

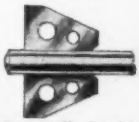
Write for special Bulletin P5 today. The Jacobs Manufacturing Company, Hartford 2, Connecticut.



Springing is taken care of by the Neoprene.



At minimum capacity.



On small shanks, jaw-bites are always parallel.

Jacobs Chucks

THE NATIONAL STANDARD FOR POST WAR PRODUCTION



JESSOP warehouses are strategically located to expedite delivery of JESSOP TOOL STEELS and other JESSOP Specialty Steels. Since the end of the war our mill and warehouse stocks have steadily increased, so that in most cases the steel you order will be on its way within a matter of hours.

Through the JESSOP WAREHOUSE SERVICE you can make substantial reductions in your tool steel inventories, because adequate stocks are available *when* you need them. And by lowering your inventories you will have more capital available for your reconversion program.

JESSOP High Speed, Alloy and Carbon Tool Steels are stocked in all standard shapes and sizes. The Jessop technical service representative will assist you in selecting the tool steel best fitted for your needs. And the Jessop Warehouse Service will insure your receiving the steel *when* you need it. Phone or write the nearest Jessop branch office for immediate help on your tool steel problems.

JESSOP STEELS CARRIED IN STOCK:

TOOL STEEL (high speed, alloy, and carbon) in bars, forgings, and sheets; HOBBING STEEL; CAST RING DIE; DRILL ROD (carbon, oil hardening, high speed); MUSIC WIRE, any size coil; CUTTING TOOLS, high speed tool bits in all grades (sand blasted or ground), cast non-ferrous bits, carbide tipped tools; GROUND GAGE STOCKS, water and oil hardening; OIL HARDENING GROUND PLATE; STAINLESS STEEL in bars (hot rolled and cold finished), sheets, and plates; STAINLESS WELDING ROD.

JESSOP STEEL CO

WASHINGTON, PENNA.

The CONE AUTOMATIC MACHINE COMPANY



sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

"Liquid Envelope" is the new commercial coating that has been used to protect fighter planes in shipment. It may be sprayed, dipped or brushed, hot or cold. *Better Finishes & Coatings, Inc., Newark, New Jersey.*

get ready with CONE for tomorrow

Three iron companies are co-operating in a joint photographic aerial survey of the Marquette Range as an aid to more detailed exploration. *Engineering & Mining Journal.*

get ready with CONE for tomorrow

A new electrical instrument is said to be so sensitive that it can measure movements as small as one ten-millionth of an inch without touching the object. *Battelle Memorial Institute.*

get ready with CONE for tomorrow

A scientific journal reports that a new type of mechanical refrigerator, employing a high-speed rotor as its only moving part, can produce temperature drops as great as 220 degrees and can, by modification, be used as a heat pump for such purposes as the heating of homes in winter. *Journal of Applied Physics.*

get ready with CONE for tomorrow

Stainless steel is being made for a black surface finish suitable for the bottoms of cooking utensils and for many applications where reflections or glaring light are a disadvantage. *Business Week.*

get ready with CONE for tomorrow

The announcement by one radio manufacturer of a new set not much larger than a package of cigarettes is expected to be followed by a rush of similar announcements by other manufacturers. *Sentinel.*

get ready with CONE for tomorrow

Prisoners of war are constructing a model of the Mississippi River drainage area to permit the study of complex problems of drainage for the co-ordination of flood control measures. *Engineering News Record.*

The Great Lakes Research Institute has been organized to do for these inland seas what the Woods Hole Oceanographic Institute has been doing for the Atlantic.

get ready with CONE for tomorrow

The Army is packing guns and other weapons and surplus material in steel or aluminum "cans", in an atmosphere of nitrogen, for storage. *Air Technical Service Command.*

get ready with CONE for tomorrow

Stainless steel can now be cut with an oxy-acetylene torch almost as easily as mild steel. *Air Reduction Sales Co., Rustless Iron & Steel Corp.*

To aid the war-to-peace reconversion of scientific research, the Senate's subcommittee on war mobilization recommends that Congress create a National Science Foundation as an independent government agency.

get ready with CONE for tomorrow

Power steering, which has been discussed speculatively for automobiles, is being used on one model of dump truck. *Heil Co.*

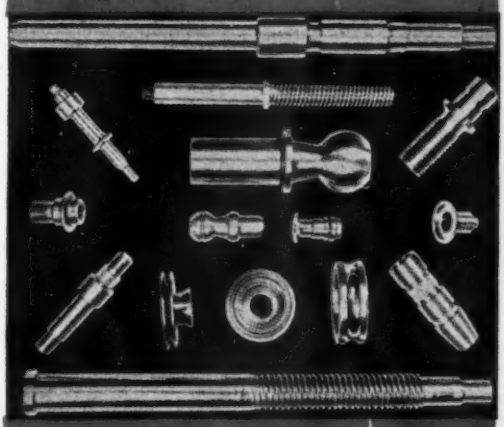
get ready with CONE for tomorrow

America's first jet-propelled plane is now a museum piece at the Smithsonian Institution. *Science News Letter.*

get ready with CONE for tomorrow

A new portable hardness-testing hammer is spring-operated and, being portable, can be used to test pieces of metal of any size, anywhere. *Steel City Testing Laboratory, Detroit.*

The 6-Spindle Conomatic will keep you ahead in the production of parts like these.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.



DUPLICATING IS OUR BUSINESS!

THE *Fastest* WAY OF MILLING FORMING DIES

A Short-Cut That Reduces Costs!

STARTLING as it may seem to you if you have never tried it, the milling of forming dies can be done on an ordinary boring mill, equipped with a Turchan Follower Attachment, in one-half the time required by former methods, doing away with the necessity of buying special machines costing several times as much.

With only a plaster model as a guide, the Turchan attachment enables the cutting tool to duplicate the contours of the model in metal—automatically and so exactly that very little hand-work is needed.

If you are seeking ways and means of keeping ahead of competition by reducing your production costs, here is a labor-saving machine that will pay for itself in a remarkably short time in man-hours saved!

The Turchan Attachment is widely used not only on boring mills for making forming dies, but also on planers for making curved contours—on lathes for turning uneven shapes—on milling machines for machining irregular surfaces—and for making a great variety of other parts, doing the work 10 to 20 times faster than by former methods.

Write for Complete Information.

TURN TO

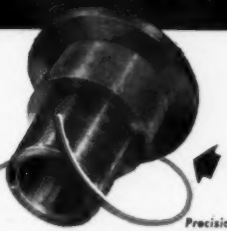
TURCHAN

TURCHAN FOLLOWER MACHINE CO.
8253 Livernois • Detroit 4, Mich.

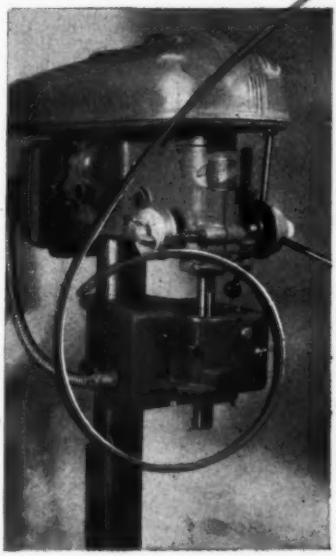
Hydraulic Follower Machine

LEAD SCREW TAPPING...

ON YOUR OWN DRILL PRESS!



Precision ground lead screw provides accurate, controlled tapping from 0-80 to 7/8".



With this ROTOREX tapping head you can convert your drill press to a precision tapping machine in a matter of minutes, and consistently produce Class III threads. To change to drilling, simply swing the ROTOREX to one side.

Employing the same principle as expensive tapping machines, the ROTOREX uses a precision ground lead screw for positive, automatic control of tapping leads and operates on a complete automatic cycle. It is rugged in construction, economical and can be operated with unskilled labor.

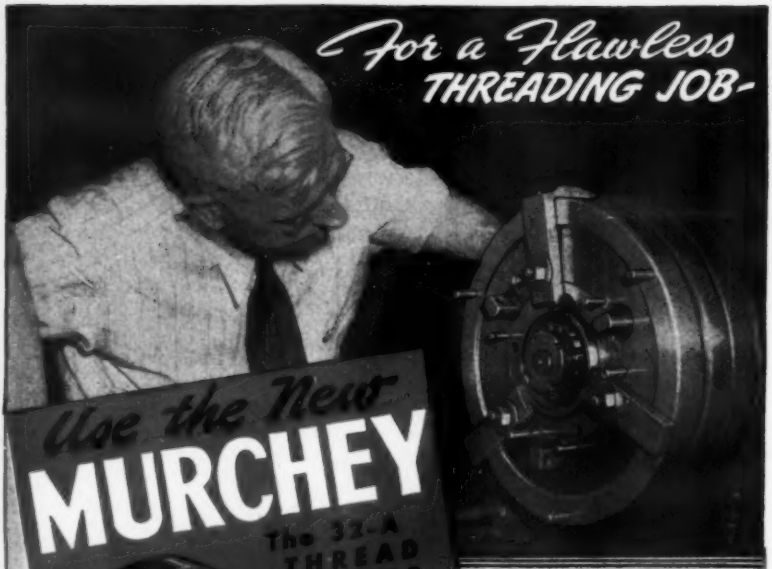
CHECK THESE FEATURES:

1. **Positive, automatic control of lead.**
2. **Hardened, precision ground lead screws.**
3. **Instantaneous emergency reverse.**
4. **Complete automatic cycle.**
5. **Accurate control of depth—accuracy to .010.**
6. **Foot control frees operator's hand for loading.**
7. **Capacity 0-80 to 1/2".**
8. **Price complete, $175.00, F. O. B. factory.**

$175.00

DOUGLAS
ROTOREX
PRECISION TAPPER

DOUGLAS **MACHINERY CO., INC.,** **146 BROADWAY, NEW YORK 7, N. Y.**



Note absence of imperfect portions of first and last threads.

Airplane propeller nut, manufactured for American Propeller Corp., Toledo, Ohio. 4½" Diameter, 8" Pitch; modified buttress thread.

NORMALLY, the first and last threads in threading operations are imperfect threads —threads with sliver ends. But not so when this *new* Murchey is called upon to do the job. It removes the imperfect portion of the first and last threads and produces perfect threading throughout — threading without a single flaw.

Designed for faster, more accurate and perfect threading, this 32-A Thread Miller is built and geared for mass production of right or left internal or external threads 1" in diameter up to 10" O.D. inclusive and up to 12" I.D. depending on the contour of the piece (larger sizes may be obtained through consultation with our engineering department), 3" long up to ½" pitch and covering full length of thread through annular milling cutters. Completely hydraulic work cycle and a variable speed drive permits the right speed and feed for each job. Write for complete catalog to Dept. M-2.

MURCHEY MACHINE & TOOL CO.
Detroit 26, Mich.

Murchey also manufactures all types of Collapsible Taps, Self Opening Die Heads and Thread Milling Machines. Write for literature on any or all of these.

MURCHEY

EASY WITH THE ACE!

The ACE reverses ordinary cutter grinding practice in that the work is held stationary while the grinding wheel traverses the edge of the cutter. The grinding wheel has a stroke of 10" and is traversed by rack and gear actuated by lever adjustable to position of operator.

The ACE is simple, highly accurate, and physically easy to work with. It saves setting-up time, only two fixtures are required to grind all types of cutters. Direct reading for clearance eliminates minutes—eventually hours—of computation. New in principle, the ACE is already old in experience in hundreds of plants.

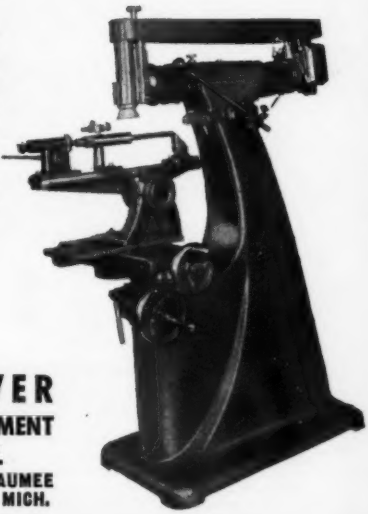
We recommend it for grinding face mills up to 15" . . slitting saws . . mill ends . . angular cutters . . slab mills . . dove tail cutters . . reamers . . taper reamers . . gear cutters . . double angle cutters. Fellows helical cutters . . production gashing . . radial relief grinding . . and newer uses found every day.

Grinds Difficult Cutters Easily!









OLIVER OF ADRIAN PRODUCTS

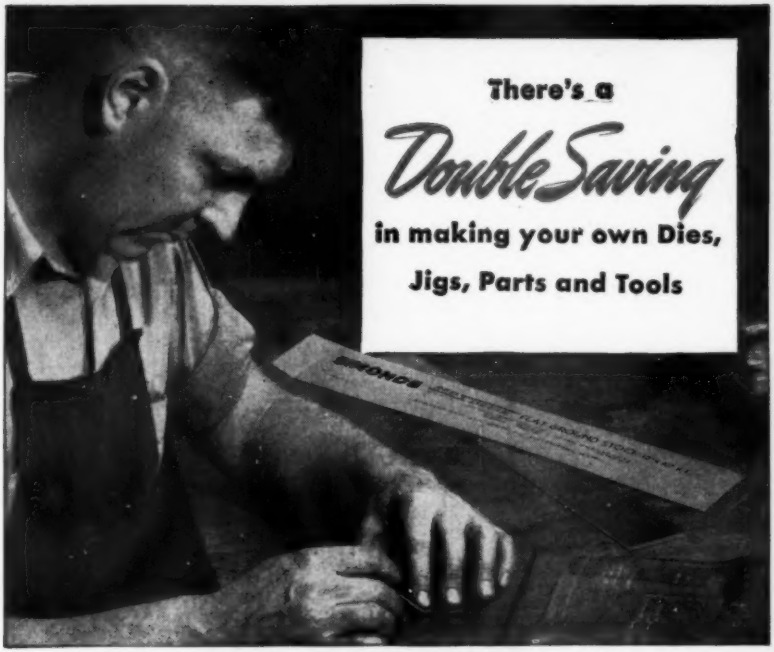
Don't Neglect Your Toolroom It's the Backbone of Production!

OLIVER INSTRUMENT CO.
1408 E. MAUMEE
ADRIAN, MICH.

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES


LOWER COSTS ON YOUR NEW PRODUCTS!
Shorten Assembly Time with...
ARO
PNEUMATIC TOOLS
Another new lightweight "champ" for assembly jobs—ARO Model 3020 Pneumatic-powered Screw Driver and Nut Setter packs the punch of a heavyweight for dependable, stall-proof operation!
The growing line of ARO-Engineered tools give you unbeatable *accuracy*, *speed* and *reliability* for the whole wide range of assembly operations including screw driving, nut setting, drilling, burring, filing, grinding, polishing and countless other portable tool jobs. ARO pays you dividends in less fatigue... more production! Write for new catalog.
The Aro Equipment Corporation, Bryan, Ohio.



...with SIMONDS Flat Ground Stock

You save the time of waiting for hard-to-get gages and tools. And you save time again... because you don't have to grind Simonds Flat Ground Stock to size. It's cut to 18" length and *accurately ground* to standard thicknesses and widths. All edges and ends are mathematically square, and all surfaces are smooth to facilitate layout work.

This stock is Simonds' own special high-carbon tool steel, uniformly annealed for easy machining and proper oil-hardening. Each piece is packed in its own envelope, plainly marked with size and directions for heat-treatment. "Red-Streak" Flat Ground Stock is made in 121 sizes, with standard sizes usually available from your dealer.

Branch Offices: 1350 Columbia Rd., Boston 27, Mass. • 127 S. Green St., Chicago 7, Ill. • 228 First St., San Francisco 5, Calif. • 311 S.W. First Ave., Portland 4, Ore. • 31 W. Trent Ave., Spokane 8, Wash. • 416 W. 8th Street, Los Angeles 14, Calif.

PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

SIMONDS SAW AND STEEL CO.

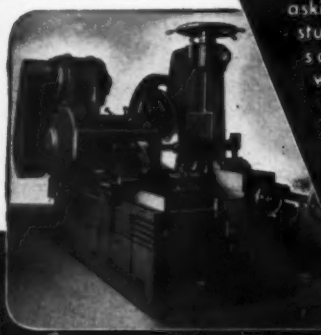
FITCHBURG, MASSACHUSETTS

What is it Costing You to SAW YOUR METAL?

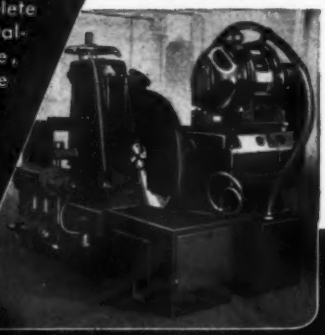
IRON · STEEL · BRASS · BRONZE · COPPER · ALUMINUM · MAGNESIUM

Are you entirely sure what it is costing you? With reconversion coming closer, lower manufacturing costs loom as more and more important. The Motch & Merryweather Engineering Department has a fund of data to assist you in analyzing and reducing your costs. It is yours for the asking. So is a complete study of your metal-sawing picture, which we will make on request. You thus incur no obligation.

M. & M. Cold Sawing Machine for ferrous metals.



M. & M. Cold Sawing Machine for non-ferrous metals.



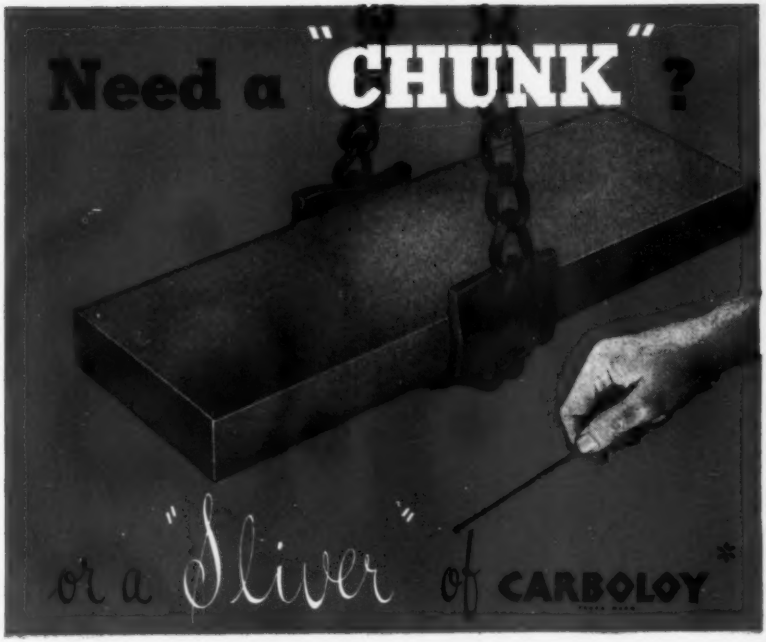
Triple-Chip METHOD

Only Merry Mills ALL 3: COLD SAW · LOW SPEED · BAND CUTTER

Call upon us to help reduce your metal-sawing expense.

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING CLEVELAND 13, OHIO

ASK FOR COMPLETE BULLETIN



Carboloy Cemented Carbide today is available to you in virtually an unlimited variety of shapes and sizes for *countless uses!*

You can obtain Carboloy in the form of rings, cylinders, rods, tubes, rectangles, spheres—practically any shape desired. Sizes made to date range from large blocks having a top surface area as great as 100 square inches—down to small rods less than 1/32" in diameter.

Put Carboloy to work *throughout* your plant—for cutting all materials, drawing and forming all metals, and as a wear-resistant metal to improve the life and performance of vital parts in equipment subject to excessive wear.

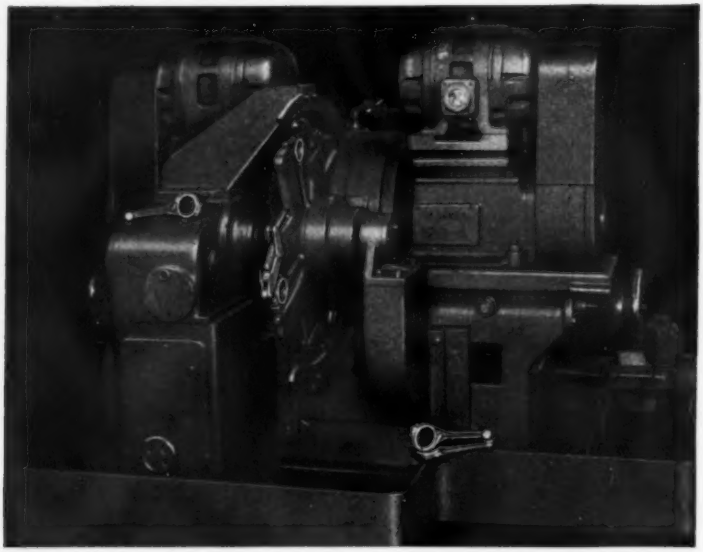
Large stocks of standard shapes and sizes. Prompt service on "specials."

CARBOLOY COMPANY, Inc.
11139 East Eight Mile Road DETROIT-32, MICHIGAN

* **CARBOLOY**
(TRADE MARK)
CEMENTED CARBIDES

A Timely Tip for PRODUCTION PLANNERS

High-quality motor car manufacturers use GARDNER-GRINDERS for a wide variety of flat-surfacing operations because they have found that these tools can be relied upon to hold work to close tolerances, while meeting large-production requirements. A typical example is the simultaneous grinding of parallel faces of connecting rods, as shown below.



These CONNECTING RODS are ground on parallel faces of the crank end by a No. 120A-23" GARDNER-GRINDER, with a 4 station rotary work carrier. Rods are clamped and unclamped automatically.

PRODUCTION: 4 to 6 rods per minute, removing .060" maximum overall stock.

TOLERANCES: .001" for flatness; .002" for parallelism, .004" for uniformity.

Give a Thought To GARDNER-GRINDING In Your *Modernization* Plans!

If your product requires flat-surfacing, write for our 8-page bulletin, "Gardner Flat Surface Grinders."

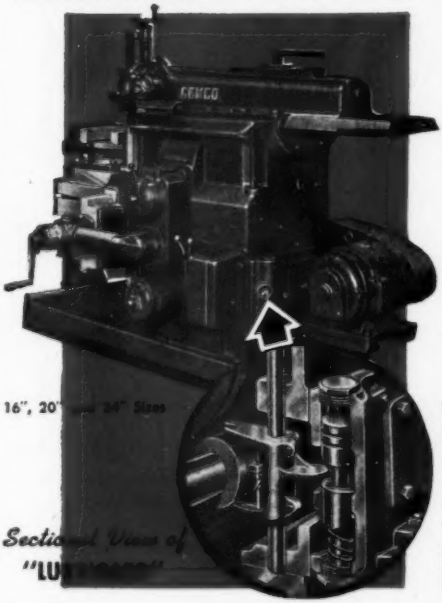
GARDNER MACHINE COMPANY

436 East Gardner Street · · · · Beloit, Wisconsin, U.S.A.

Only GEMCO Shapers Give You "LUBRIGARD"

This exclusive SAFETY Device Insures Proper Lubrication, Automatically

– AND Safeguards Operator, Machine and Work Piece!



16", 20" and 24" Sizes

Sectional View of "LUBRIGARD"

Oil under pressure forces piston down, permitting projection on clutch control lever shaft to clear recess in piston, thereby allowing control lever to move into starting position.

The function of "LUBRIGARD" is to automatically prevent the ram of the machine from being started:

1. In case oil supply in reservoir is insufficient;
2. Should pressure in the system be below the minimum required;
3. Should a leak or failure of the oil pressure system occur;
4. Should the filter become clogged;
5. Should the drive pulley rotation be incorrect.

In addition, "LUBRIGARD" will prevent the clutch control lever from being engaged while the drive pulley is at rest. Therefore, should the motor be started, the ram will not move unexpectedly. This prevents injury to the operator, or damage to the machine or work piece.

"LUBRIGARD" assures long, satisfactory shaper performance, because of adequate, automatically-controlled lubrication of all bearing surfaces. *It increases the Precision Life!*

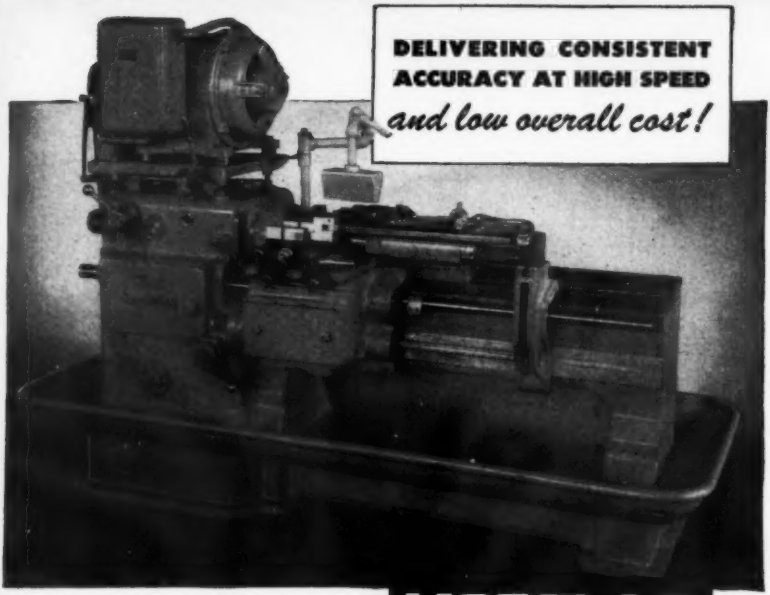
GEMCO

Multi-Purpose SHAPERS

GENERAL
ENGINEERING & MFG. CO.
SAINT LOUIS 4, MISSOURI

MANUFACTURERS OF PRECISION MACHINERY SINCE 1917

Write Today for Bulletin GC-12.B



DELIVERING CONSISTENT ACCURACY AT HIGH SPEED *and low overall cost!*

MODEL Lo-swing LR

. . . with

- **SIMPLIFIED CHANGE-OVER MECHANISM**
- **SMOOTH HIGH-SPEED DRIVE THRU MULTIPLE "V" BELTS**
- **HEAD AND TAILSTOCK SPINDLES ON THREE PRECISION, PRELOADED BALL BEARINGS**
- **IMPROVED MECHANICAL BRAKE THAT OPERATES AUTOMATICALLY WITH *START* AND *STOP* LEVERS**
- **HARDENED STEEL WAYS**
- **OTHER FEATURES THAT REDUCE SETUP TIME**

THE Model "LR" Lo-swing's field includes practically any work within its capacity—2" diameter for heavy stock removal, 4" diameter for light cuts, 5" diameter for flanged work—and up to 46" between centers in the longest bed length. Ease of setup and operation are provided not only by the Simplified Change-over Mechanism but by convenient levers for throwing in and out the feed and rapid traverse (normally automatic) manually, and by the low center height (37-⅞") which allows the operator to examine and adjust all tools from the operating position. Low center height also contributes to ease of loading.

The model "LR" is designed to provide maximum efficiency with carbide tools. It is a versatile lathe in that it may be equipped with either direct V belt drive to the spindle for high speed, fine finishing cuts, or a geared drive with pick-off gears for slower roughing cuts. This lathe may also be equipped with a third slide (overhead) as well as additional back squaring attachments, carriages and carriage slides, making for innumerable tooling possibilities.

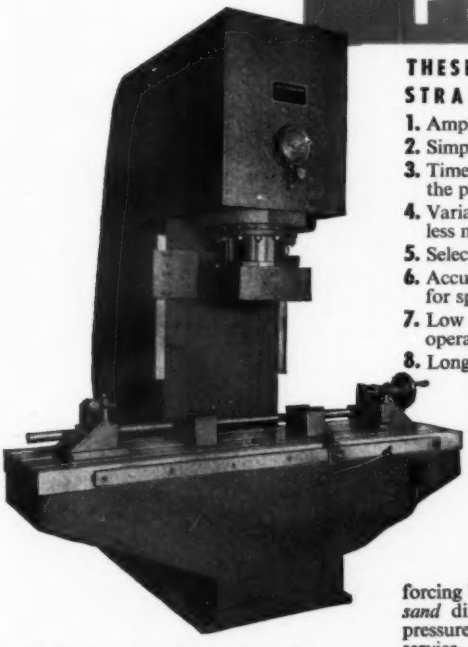
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SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALLS

OPEN SIDE PRESSES

Proportionate Control for Accuracy with Speed



Model 6430 Elmes 150-ton open side press, shown with shaft-straightening fixtures. Bed: 96" x 24". Platen: 17" x 18". Opening: 32". Maximum Stroke (adjustable): 20". Speeds, in inches per minute: Advance, 75; Pressing, 12; Return, 150. A rugged, welded steel frame, self-contained unit suitable for many purposes. Other types include power-traveled table designs for very heavy pieces.

THESE THINGS YOU WANT IN STRAIGHTENING PRESSES...

1. Ample, Responsive Power.
2. Simple, Sensitive Control.
3. Time-Saving Rapid Traverse to and from the piece.
4. Variable Slide Travel, to eliminate needless movement.
5. Selective Pressures, to suit the job.
6. Accuracy, for consistently good work—for speed with confidence.
7. Low Maintenance, for uninterrupted operation.
8. Long Life, for years of useful service.

Elmes open side presses give you all this, and *more!* Nearly a century of specialization built the Elmes reputation for *dependability*—produced equipment which set such *outstanding records* in war production.

Elmes open side presses are *ideal* for straightening steel castings, shafting, forgings—for forcing bushings in or out—and for a *thousand* different uses wherever controllable pressure is needed. Types and sizes for every service, in capacities from 12 to 600 tons, and larger. Write, *today!*

ELMES HYDRAULIC EQUIPMENT

ELMES ENGINEERING WORKS OF AMERICAN STEEL FOUNDRIES, 244 N. Morgan St., Chicago 7, Ill.

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IN THE TOOL ROOM
IN PRODUCTION

Designed for the Tool Room and Die Shop where precision workmanship is all important... Built with Boyar-Schultz quality, resulting in sturdiness that HOLDS accuracy, not only in tool and die work, but in production wherever accuracy is necessary.

PROTECT YOUR TOOL DOLLAR WITH THE FINEST



No. 618 SURFACE GRINDER
A sturdy, easy operating Surface Grinder, designed for the Tool Room and built to give positive precision performance over long periods of time.

No. 1 PROFILE GRINDER
A bench size Profile Grinder. A time saver in grinding dies, punches, cams and templates. Operates at 20,000 R.P.M. A rapid stock remover.

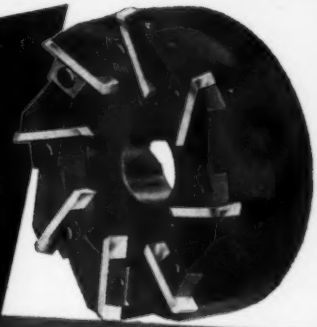
No. 2 PROFILE GRINDER
A larger, heavier Profile Grinder with two independently powered spindles, operating at 10,000 R.P.M. with vertical oscillations.

WRITE FOR CIRCULARS DESCRIBING THESE MACHINES

BOYAR-SCHULTZ CORPORATION
2108 Walnut Street, Chicago 12, Illinois

The New KENNAMILL "UNIVERSAL" FACE MILL

WITH WEDGED-IN, SOLID KENNAMETAL BLADES

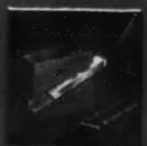


Reduces

- ✓ PRODUCTION COSTS
- ✓ TOOLING COSTS
- ✓ OFF-THE-JOB TIME
- ✓ GRINDING EXPENSE



ADAPTABLE FOR HIGH RATE MILLING ON ALL TYPES OF METAL



BLADES ARE RESHARPENED ON SURFACE GRINDER

The Kennamill "Universal" Face Mill can be used for milling different materials, at high rates of metal removal, simply by interchanging blades having the right grade of Kennametal and proper cutting angles. Advanceable, solid Kennametal blades are wedged into the sturdy steel body at fixed angles, after having been ground on the edge to provide an effective cutting angle—negative radial rake for steel; positive radial rake for cast-iron and non-ferrous materials.

All design features of this cutter contribute to the possibility of removing a large volume of metal between regrinds. Radially set blades, rigidly supported, maintain their edge longer; and, because the blades are wedged-in instead of brazed-on, brazing strains are eliminated, either initially or during grinding. Hogging cuts, up to a depth of ½", are entirely feasible. Ample chip accommodation is provided for all depths of cuts.

The solid Kennametal blades can be reground on a surface grinder, as described at the left, thus eliminating need for special cutter grinders, and greatly reducing off-the-job time required for reconditioning cutters having brazed-in tips. Blades can be resharpened many times, then used in smaller "Universal" Cutters.

The Kennamill "Universal" Face Mill is available in four sizes—4", 6", 8", and 10". Prices and particulars are yours for the asking.

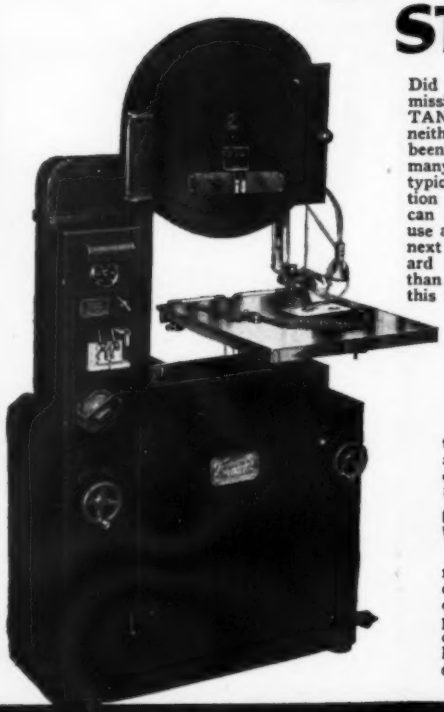
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Tannewitz

the DI-SAW with Extra SPEED AND EXTRA STAMINA



Did you ever hear of a transmission going haywire on a TANNEWITZ DI-SAW? No, neither did we, though we have been making die saws for a good many years. And that's just typical of the superior construction of the entire machine. It can take the severest kind of use and always be ready for the next job. Moreover the standard model has larger wheels than customary in machines of this type — a full 24 inches — for greater traction, straighter, faster sawing and more production. Get the complete facts and you'll discover why TANNEWITZ DI-SAWS always show the best possible return on an investment in equipment of this kind. Write for "DI-SAW" Bulletin.

OTHER MODELS TO HANDLE WORK OF PRACTICALLY ANY SIZE

make available the tremendous savings of inside and outside sawing, filing and polishing on dies, jigs and other work too large to handle on the standard machine. Bulletin on request.

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High Production DRILLHEADS



Save Money
Make Money

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MULTIPLE SPINDLE *Drillheads*



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DIVISION OF
THOMSON INDUSTRIES, INC.
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We make no standard type motors BUT . . . If you have a special powering problem, we will design and build a motor to meet those special requirements.

Hundreds of machine manufacturers know from experience that there is no machine powering problem too difficult for us to solve. The thousands of custom-built Welco Torque Motors rendering low cost, dependable service throughout the country today are the finest proof possible of the unique and outstanding engineering "know-how" of The B. A. Wesche Electric Company.

The special motor that others can't or won't build poses a particular challenge to us. In our thirty-five years of custom-built motor experience, we have successfully solved every powering problem placed before us. Because it is a matter of pride with us to keep that record perfect, you can depend on us to build the functionally correct motor to meet your special powering needs.

EXCLUSIVE FEATURE

The "Uni-frame" construction of WELCO Torque Motors provides for an easy interchange of A.C. and D.C. motors to fit the same housing or frame. Only WELCO has this vitally important feature.

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Speed RECONVERSION with Time-Saving SKILTOOLS!

These portable electric tools speed every drilling, sawing, sanding and cutting job on wood, metal, masonry products and compositions. They will help you complete your change-over work quicker . . . enable you to swing into full peace-time production sooner.

Every SKILTOOL is light, compact, powerful, easy to handle . . . and there is a complete range of sizes and models, assuring you of the right tool, in the right size, at the right time. Call your distributor today for a demonstration!

SKILSAW—speeds countless cutting jobs in wood or metal...removes worn out flooring . . . builds bins, shelves, partitions faster . . . speeds crating or uncrating of machinery.

SKILSANDER—Disc Type—speeds cleaning and refinishing of all concave or convex surfaces of wood or metal . . . ideal for production work, grinding welds or polishing many products.

SKILSHEAR—speeds the cutting of hot rolled steel up to 16 ga., and softer materials in proportion . . . ideal for sheet metal fabrication in repair, maintenance or production work.

SKILDRILL—speeds all drilling in wood or metal on electrical, plumbing and carpenter jobs . . . use later in production drilling . . . 14 models, ¼ to ½ inch capacity in steel.

SKILGRINDER—Spindle Type—speeds grinding of irregularities in metals . . . removes heavy weld beads . . . use later to step up grinding and finishing operations in production.

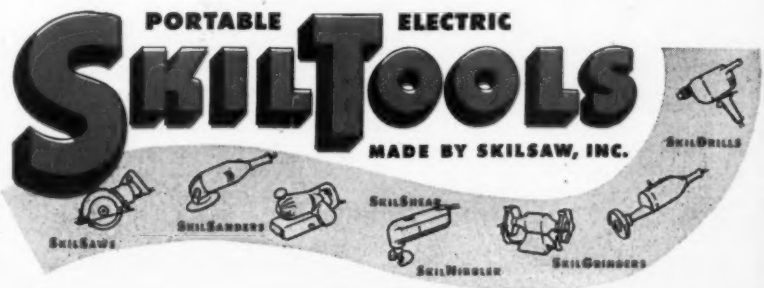
SKILNIBBLER—speeds cutting irregular sections of hot rolled steel or galvanized iron up to 14 ga., softer materials in proportion . . . light, perfectly balanced, easy to handle.

SKILSANDER—Belt Type—speeds refinishing of all flat surfaces of wood, metal or compositions . . . reclaims used wood or metal . . . refinishes desks, tables, etc. . . . use later for greater efficiency in production.

SKILGRINDER—Bench Type—speeds sharpening of many types of tools . . . twist drills, taps, chisels, cutters, etc. . . . place them in convenient spots throughout the plant.

SKILBLOWER—speeds cleaning dust and dirt out of stock bins, shelves, motors, radiators, etc. . . . delivers dry air at high velocity under low pressure . . . easily converted into a vacuum cleaner by using suction attachments.

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KEYWAYS... 10 Times Faster

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THE GLENNY *adjustable-expansion* *Push* BROACH



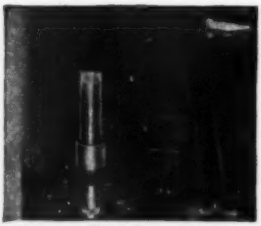
Steel Bushing — Keyway cut 3/16" deep, 3/8" wide—in production quantities.

Maintains ± .0005 Accuracy

Broaches slots of greatest accuracy to an average length of five inches and up to 5/8" widths. May be used on Arbor Presses, Lathes, Screw Machines and other equipment.

10 TIMES FASTER THAN ORDINARY METHODS

The bushing illustrated was slotted with a Glenny Broach in one-tenth of the time required by a shaper for the same operation. Full information in Bulletin 9. Send for it today.



Glenny Broach in use on an Arbor Press



Glenny Broach in series with other tools for multiple operations on a Turret Lathe.



Patent No. 2,184,383

★ ★

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Manufacturers of RZEPPA Constant Velocity Universal Joints, and PORMSPRAG— the full complement Overrunning Clutch.

Special Machines...
FOR SPECIAL GRINDING OPERATIONS



One of many special GEARGRIND Machines designed and manufactured to meet unusual production requirements is used by Pratt & Whitney Aircraft Division of United Aircraft Corporation to grind the part pictured at the left

The problems involve indexing that would handle irregular spacing of the cam lobes, and trimming the grinding wheel for five radii with three diamonds in a two stage automatic trimmer. Both sides of the wheel are first trimmed to a true 15° radius, using radius arms less than four inches long. The root radius and small fillets are then trimmed in one continuous dress, all five radii blending perfectly.

GEARGRIND engineers welcome every opportunity to discuss all problems involving new applications of FORMED WHEEL GRINDING

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One piece or a million! We have the know-how and equipment to help you in reconversion

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FOR CUTTING BIG HOLES

MARTIN PRODUCTION HOLE CUTTERS

Working Range 7/8" to 12" Diameter

Circle-cutting — hole-cutting — large washer-cutting — all are done to a high-accuracy standard with a Martin Production Hole-Cutter. Steel, aluminum, brass, fiber, wood and other materials respond to the high-speed action of Martin Cutters. For use in drill press, lathe or portable drill.

The Martin set listed provides an accurate work-range of 7/8" to 12" diameter circles or holes — each size is quickly adjustable to cut to any dimension within its range. Martin Cutters make true cuts. Cutter bit is easily reground. Five sizes with Morse Taper Shank; two with Straight Shank. Each cutter furnished with hardened pilot, interchangeable with pilot drill.

IMMEDIATE DELIVERY

Martin Production Hole Cutters are unconditionally guaranteed to meet your requirements! Order at once for prompt shipment and extend priority rating.

Sets No. 1 and 2 as listed below, are supplied in sturdy, protective fitted wood cases.

WIDE RANGE OF SIZES

No. 1—With No. 1 Morse Taper Shank—7/8" to 2 1/2"	$13.50
No. 2—With No. 2 Morse Taper Shank—7/8" to 4"	17.00
No. 3—With No. 3 Morse Taper Shank—1 1/8" to 6"	19.75
No. 4—With No. 4 Morse Taper Shank—1 1/2" to 8"	23.50
No. 5—With No. 5 Morse Taper Shank—1 3/4" to 12"	31.00
No. 1-S—With 3/8" Straight Shank—7/8" to 2 1/2"	12.50
No. 2-S—With 1/2" Straight Shank—7/8" to 4"	16.00
Set No. 1—Includes one each of the above	133.25
Set No. 2—Includes Numbers 1, 2, 3, 1-S & 2-S	78.75

MARTIN ENGINEERING COMPANY

KEWANEE, ILLINOIS

New Speed Quench FURNACE



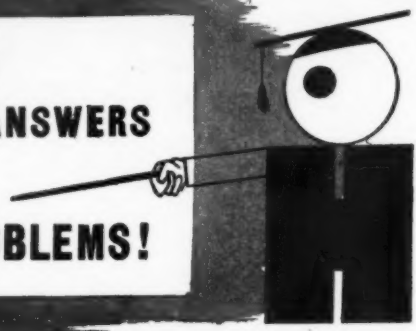
The Upton Speed-Quench Furnace is built with a series of step-backs and employs a system of balancing the high radiation rate with an input of heat at the bottom of the pot.

The result: A vigorous, continuous surge of molten salt throughout the entire bath. Work that is quenched by *this* strong wash comes out of the bath perfectly and uniformly quenched.

Upton ELECTRIC FURNACE DIV.

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HOFFMAN
HAS ALL THE ANSWERS TO YOUR COOLANT PROBLEMS!

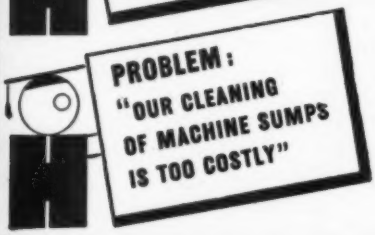




SOLUTION: Coolant control by Hoffman Filtration is the answer. Hoffman Filtration Equipment puts precision finishing on a volume basis, controls the quality, definitely reduces rejects.



SOLUTION: For conserving life of grinding wheels and cutting tools, there's no coolant like a clean coolant. Hoffman coolant filtration reduces wheel glazing, saves many wheel redressings.



SOLUTION: Hoffman filters with automatic sludge disposal are the answer to this one — permit practically continuous operation, reduce maintenance.

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WINS ON UNIFORMITY



Recently one of the largest steel companies in the world (name on request) switched to DoALL Band Saws, only after making 29 very minute and concrete, comparative tests.

DoALL won on the basis of UNIFORMITY. Some saws cut faster on the first coil, then fell behind on the second or third, but DoALLs were most uniform, coil after coil, job after job.

A perfect saw for every material

You name it—there's a best DoALL saw for it, whether the job is external or internal cutting, straight line, contour shaping or 3-dimensional work.

DoALL Saws are available in two general styles, Precision and Buttress. Packed in 100-ft. coils in safety dispensing boxes or cut and welded to fit any band sawing or cut-off machine.

REQUIRE NO RESHARPENING

DoALL saw blades are so tough and give so much additional service that it is economical to run them until worn out and then replace with new blades.

PRECISION SAWS

Recommended for use on all ferrous metals. Come in widths from 3/32" to 1", pitches 6 to 32.

BUTTRESS SAWS

The finest for non-ferrous metals, aluminum, magnesium, plastics, laminates, ceramics, wood, etc. Widths 1/4" to 1". Pitches 2 to 6.

Write or phone for booklet illustrating and listing all DoALL Saws.

INDUSTRY'S NEW SET OF TOOLS



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Birmingham	3-0582	Denver	GE 7511	Los Angeles	TR 3971	Minneapolis	GL 1173	Orlando	0056	Pittsburgh	AT 3300	Reading	7250	Stateswille	518
Boston	KEN 0060	Detroit	TY 2-3000									Rochester	MAIN 5175	Syracuse	3-7212
Buffalo	PA 0660	El Paso	MAIN 7046									Rockford	MAIN 227	Toledo	GA 8300
Chicago	SEE 1100	Grand Rapids	6-0672									St. Louis	CE 3621	Toronto	RA 5101
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Dallas	8 6010	Indianapolis	LI 0057									San Francisco	GA 4704		

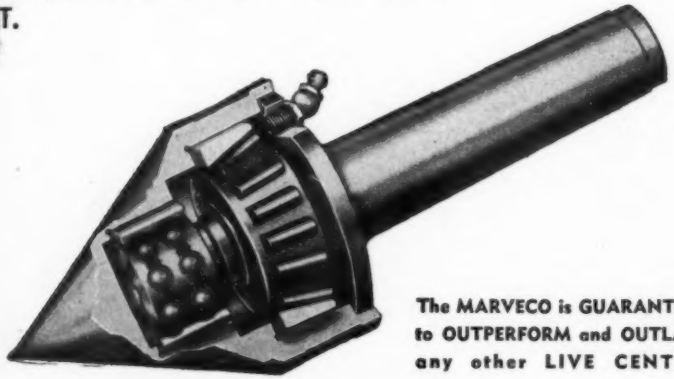
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LONG LIFE PRECISION

Marveco precision is built into the tool. When you buy Marveco you buy months of uninterrupted precision. Marveco WEARS IN not OUT.



The MARVECO is GUARANTEED to OUTPERFORM and OUTLAST any other LIVE CENTER.

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Send us your CENTER PROBLEMS

MARVEL TOOL & MACHINE COMPANY

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The all-important operation of shifting mandrel rods and troughs in and out of dies on this new drawbench is controlled by Quick-As-Wink valves. Many manufacturers of drawbenches use valves made by C. B. Hunt & Son, Inc.

Engineers choose Quick-As-Wink valves because of their long record of dependable, maintenance-free service. Their U-shaped packers are pressure sealed against internal leakage. Plungers and bodies on ALL Hunt valves are buffed and polished stainless steel.

If the valve action you want is not shown in the factual Quick-As-Wink catalog (copy upon request), write us about your requirements. We have developed and built several hundred valves since our latest catalogs were issued.

C. B. HUNT & SON, Inc.

1835 E. PERSHING ST. • SALEM, OHIO

AIR WATER OIL

NORTON *has Complete Service for*

Crystolon Grinding Wheels and Three Types of Diamond Wheels

CUTTING OFF

For cutting carbide blanks into tips and for salvaging broken carbide tools there's the Norton Metal Bonded Diamond Wheel. It's a strong, fast-cutting, long-lived wheel. And because it is very thin, there's minimum waste of carbide. The most popular specification is D120-N100M 1/8 — diameters 3", 4", 5" and 6".

ROUGHING SINGLE-POINT TOOLS

The new improved Open Structure Crystolon Wheel is making records in many plants for roughing large single point tools. It cuts faster and cooler and requires less dressing. Stocked in size 14 x 4", 1½" rim, plate mounted, in two specifications 39C60-F12VP and 39C60-G12VP Also popular is the Norton regular structure Crystolon wheel such as 39C60-17. For backing-off the steel shank there's an Alundum wheel — 38A46-K5VBE.

FINISHING SINGLE-POINT TOOLS

Outstandingly successful for finishing single-point carbide tools is the new Norton Vitrified Bonded Diamond Wheel with its combination of a fast cutting action plus exceptional resistance to wear and grooving. It is stocked in size 6 x ¾ x ⅛" (¾" rim) to fit all 6" carbide tool grinders in specifications D120-N100V 1/16 and D-150-P100V 1/16.

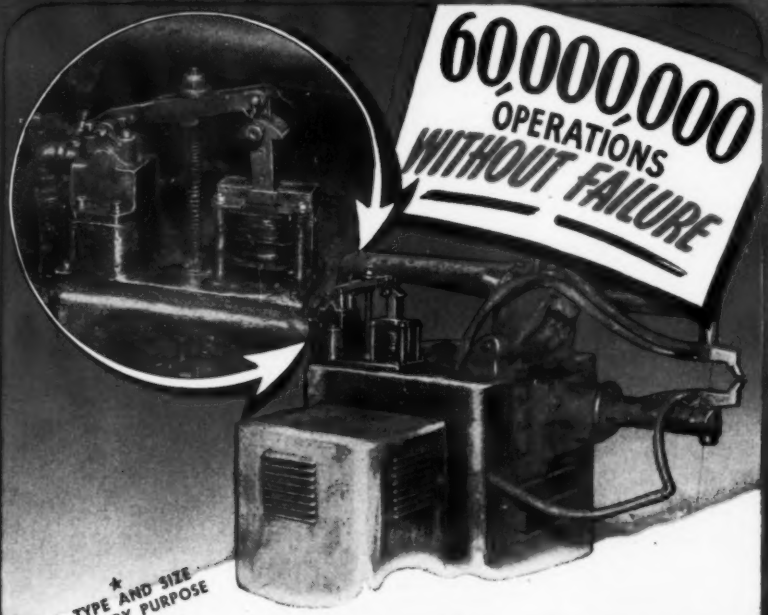
Also available are the Norton fast cutting Resinoid Bonded Diamond Wheel and the durable Metal Bonded.




GRINDING CARBIDE TOOLS
GRINDING CHIP BREAKERS
A fast cutting action is combined with long life and exceptional ability to hold corners in the Norton Vitrified Bonded Diamond Wheel. Available in 4 and 6" diameters, 1/4" thick; suggested specification D150-N100V 1/8. And for grinding narrow grooves, where wheels 1/8" thick are used, Norton hard grade Resinoid Bonded Diamond Wheels are available, such as specification D120-N100B 1/8.
SHARPENING MILLING CUTTERS
For grinding milling cutters, reamers and other multipoint tools Norton has a complete line of Resinoid Bonded Diamond Wheels in shapes and sizes for all types of tool and cutter grinders. Especially popular are the new flaring cup shapes. These are stocked in 3", 3 3/4" and 5" diameters in specifications D150-L100B 1/16.
HONING
For touching up carbide tools on the lathe to prolong the time between regrindings there is the Norton Vitrified Bonded Diamond Hand Hone. It's a fast cutting, wear resistant hone that stays sharp and resists grooving. Popular stock specifications are: single end type D320-V1/16, double end type D220/440V 1/16.
TOOL ROOM
SEE THE NORTON FILM on Carbide Grinding A Practical Instructive Motion Picture with Sound and Color
NORTON ABRASIVES
NORTON COMPANY, WORCESTER 6, MASS.


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Sensory
TORQUE
WRENCH
-HEAR-FEEL-SEE-
GET THE FACTS
INTRODUCED just a year ago, there are today STURTEVANT Sensory Torque Wrenches which in continuous service have already exceeded 1,000,000 deflections; still in daily use, still accurate, without servicing or adjustment.
Here is a new thing in torque control you should know about . . . get the facts.
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ADDISON QUALITY ILLINOIS
WRITE FOR BULLETIN S.W. 15
THE WORLD'S LARGEST MANUFACTURERS OF TORQUE WRENCHES

60,000,000 OPERATIONS WITHOUT FAILURE



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ROSS *Air Control* VALVES

THE BRIDLE FOR AIR HORSEPOWER ★

Sixty million operations without failure—such is the record of this Ross Solenoid-operated Air Valve, attached in 1938 to a Taylor-Winfield welding unit operating in the Zenite Metal Corporation plant at Indianapolis. Faultless performance through seven high-pressure production years.

Ross air valves are engineered and built to give long years of faithful service.

ROSS *Operating* **VALVE CO.**

6480 Epworth Boulevard

DETROIT 10, MICHIGAN

Do You Want

QUICK, ACCURATE CHECKS of Internal and External Diameters?



HOLE CHECKER
for Inspection and Production gaging.



AMPLIFYING GAGE
As simple to read as a clock.

These Modern AMERICAN GAGES are the ANSWER!

The HOLE CHECKER gages inside diameters up to 12" for size, taper, bell-mouth and out-of-round condition.

The AMPLIFYING GAGE checks pistons, bushings, valve stems, piston pins, etc., up to 5" diameter.

These instruments are easy to set up; rapid and precise in operation. Accurate to .0001".

Send your part prints or sketches for quotation on Hole Checker unit and sizing plugs made to meet your production requirements. Request Bulletin 43 for details on Amplifying Gage, Hole Checker, Thread Checker, Bench Center, Radius Dresser and Lapping Plate.

THE AMERICAN GAUGE CO.
125 Bayard St. DAYTON 1, OHIO



for HIGH PRODUCTION RATES

"Standard" Rolling Mills assure high production hot or cold rolling of your strip, rod or ingot. Speeds are provided for rolling metals in any range from 10 feet to 500 feet per minute, depending upon your needs. Two, Three, or Four High Mills are available with roll sizes from 1½" diameter and 1" face to 16½" diameter and 18" face.

"Standard" manufactures special units for grading, cross and pinch rolling, forming wire to exact dimensions, and for a large variety of shaping operations.

Catalog section RM and detailed recommendations will be sent upon request.

STANDARD MACHINERY COMPANY
1555 Elmwood Ave.
Providence 7, R. I.

All Of One Quality

The Finest!

Chicago Standard Screw Products are manufactured from finer materials and are unsurpassed for their increased strength, greater accuracy and perfect uniformity. In your present plans for increased production—try "Chicago Screw"—manufacturers of precision-made Standard Screw Products.

These Fine Products are sold only thru Authorized Distributors



THE CHICAGO SCREW CO.

ESTABLISHED 1872

1026 So. Homan Avenue Chicago 24, Ill.

DUAL FEED . . .
and why you need it

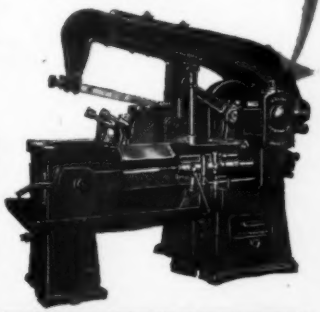
RACINE's exclusive "Dual Feed" consists of Positive and Flexible Feed, progressively applied — hydraulically controlled. Round bars, odd shaped pieces, tubing and free cutting stock require a compensating type of feed for maximum cutting efficiency. RACINE's "Flexible Feed" automatically picks up speed as the resistance to the blade decreases. You benefit by increased output.

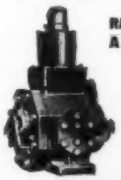
With "Positive Feed" on your RACINE Machine, all cuts are made in exactly the same time, predetermining production. Our dealers and factory engineers will make up recommendations without cost to you.

Free Catalog No. 12 describes the various machines in capacities from 6" x 6" to 20" x 20". Write today.

comparison proves

- The RACINE Machine line is complete — all capacities from 6" x 6" to 20" x 20"
- All RACINE Saws are simple, easy to operate, rugged and long lived.
- Special designs are available for special jobs. Sawing is cheaper than milling.
- Service and sales facilities available everywhere. Deal with trained and experienced machine tool men.





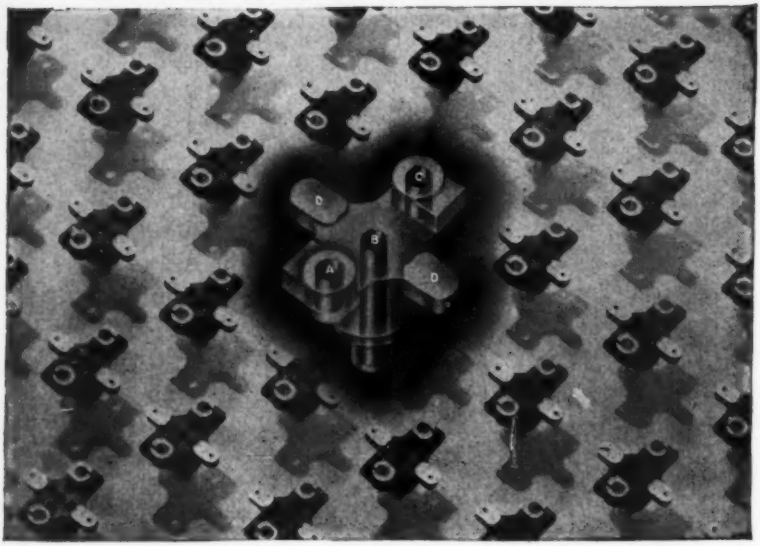
RACINE "VARIABLE VOLUME" PUMPS . . A MODERN SOURCE OF HYDRAULIC FORCE

Oil Hydraulic Power from 50 to 1000 lbs. P.S.I. Variable Volume from zero to 30 G.P.M. Use RACINE Pumps on your new designs and apply them to existing circuits. Let our hydraulic division engineers help you. Racine Tool and Machine Co., 1754 State St., Racine, Wis.

RACINE

Racine

THE PRODUCTION SAWS OF MODERN INDUSTRY



How to use the *Moore Jig Borer* as a Production Machine

Three holes located and sized, two pads milled—in a single set-up; 5,000 parts—6 minutes each.

Are you limiting the capacity of your jig borer to toolroom work? You needn't...if it's a Moore Jig Borer.

For this versatile machine often outperforms production machines. Here's proof: Holes A, B and C were located to .0005", sized to +.0005",—.0000" and parallel to .001" checked on plugs 1" long, two pads D milled to ±.001"... in one set-up.



A drill jig couldn't handle such tolerances; reamers and bushings would wear. Besides, aluminum is not free-machining.

The only answer was single-point boring. After the holes were roughed out with a jig costing $75, the Moore Jig Borer machined them to exact location and size, and milled two pads. The entire operation required only six minutes each.

Such speed and accuracy are the result of the Moore Jig Borer's sensitive spindle which provides speeds to 2,600 RPM, and quick-setting lead screws. The latter, ground to an accuracy of .0002" in 16", enables you to spot, drill, bore and ream holes in one set-up, with minimum tool changes.

Remember this versatility when you specify your next jig borer. Meanwhile, write for illustrated literature.

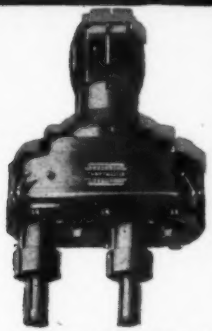
MOORE SPECIAL TOOL CO., INC.
728 UNION AVENUE, BRIDGEPORT 7, CONN.

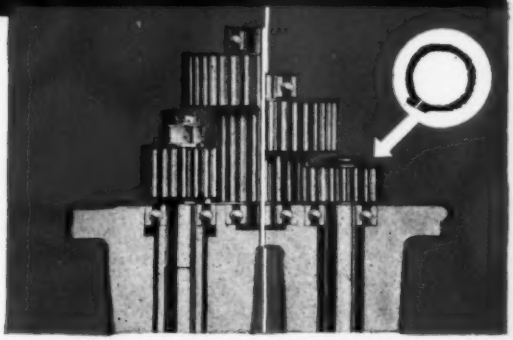
MOORE JIG BORER

MOORE TOOLS

SPOTS, DRILLS, BORES, REAMS...WITH MINIMUM TOOL CHANGES

Another Proof that Waldes Truarc Retaining Rings holds moving parts together better!





1 Waldes Truarc Retaining Rings helped Thomson Industries Inc. *save up to 10% in overall dimensions* on *THRIFTMASTER* Drillheads.

2 BEFORE TRUARC

Thomson Engineers wanted to make *THRIFTMASTER* more compact, without loss of speed or capacity.

3 AFTER TRUARC

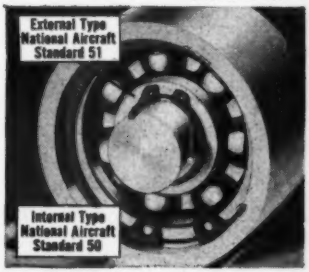
Waldes Truarc Retaining Rings made the desired simplification possible and increased the efficiency of Thriftmaster drillheads.

"Waldes Truarc Retaining Rings enabled us to make substantial time and labor savings in production of THRIFTMASTER DRILLHEADS...and made possible a much lighter, handier, more rugged tool, exceeding our highest performance requirements."

(Signed)
THRIFTMASTER PRODUCTS DIV.
Thomson Industries, Inc.

IN HOLDING and positioning machine parts, Waldes Truarc Retaining Rings offer advantages over nuts, shoulders, collars and pins. They save cost by simplifying production. They make assembly and disassembly easier. Put on and removed again and again, Waldes Truarc Rings retain the perfect circularity that gives them their unfailing grip. Test them yourself. We'll furnish samples and complete data. Write Dept. M-11.

U. S. PAT. RE-18,144



WALDES
TRUARC
TRADE MARK
RETAINING RING

Waldes Kohinoor, Inc., Long Island City 1, New York

CANADIAN REPRESENTATIVES: FRENCO PROGRESS CORP., LTD.
72-74 STAFFORD STREET, TORONTO

SO...NOW WE'RE BACK WHERE ARITHMETIC REALLY COUNTS...

This is pre-war stuff.

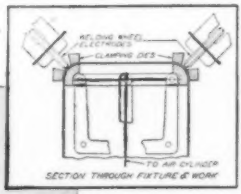
We cite it because it bears directly on the kind of goods you will make from now on, for Joe Civilian . remember him?

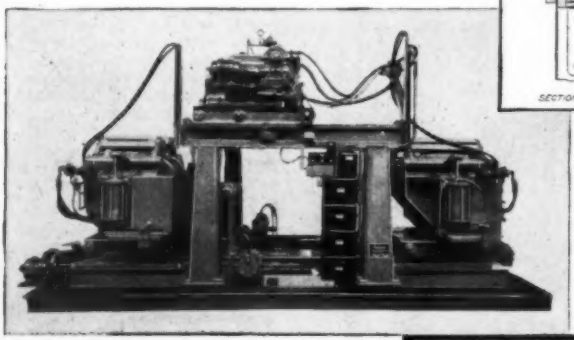
Production cost savings which must be made to maintain that better-than-pre-war standard of living necessary to your expanded facilities CAN be made in metal working industries by the application of Federal Resistance Welding.

The cost arithmetic shown is from the records of one of the country's leading manufacturers. Three Federal Seam Welders of the type shown on the next page were installed in their plant. Their use resulted in annual savings of $18,000 in costs. A report of 2½ years operation showed the welders had paid for themselves and returned $24,000 profit.

Except for the fact that it is comparatively a modest example, this is typical of direct savings achieved when a product and Federal Resistance Welding are brought together by careful engineering and design. Such records are not limited to any one type of metal working industry. Successful applications cover everything from small parts assembly or joining stainless steel blades to mild steel handles for tools or cutlery, clear through all branches of sheet metal fabrications (including refrigerator liners, casings, grilles and parts) to heavy flash welding of steel ring gear blanks ten or more feet in diameter, with solid cross-sections of eighteen inches.

To find out how Federal Resistance Welding can affect the arithmetic of your particular production problem, send your specifications for applications analysis





THIS FEDERAL RESISTANCE SEAM WELDER

Seam welds multiple, leak-tight joints like this.

INSTALLED BECAUSE IT CUTS COSTS

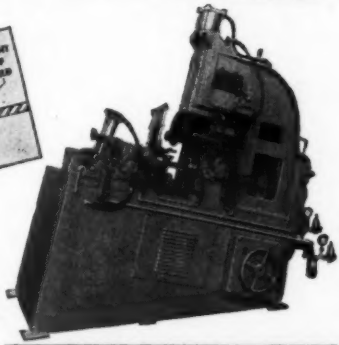
The Federal

MACHINE AND WELDER CO.

THIS KIND OF



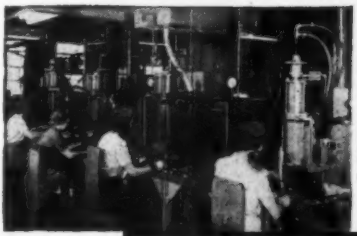




THIS FEDERAL RESISTANCE SEAM WELDER

Seam welds refrigerator casings like this.

INSTALLED BECAUSE IT CUTS COSTS



THESE FEDERAL RESISTANCE WELDERS

All standard models, attain high production in assembling small parts components.

INSTALLED BECAUSE THEY CUT COSTS

216 DANA ST., WARREN, O.

MEMBER R.W.M.A.

VERSATILE MODERN PRODUCTION TOOLS

NEW HYDRAULIC WELDERS

Two new models of spot and projection welders, hydraulically operated, are described for the first time in detail in Bulletin 4520 issued by The Federal Machine and Welder Company. One type, available in three sizes with 30, 50, or 75 KVA transformers, employs an inverted hydraulic cylinder in which the piston rod is the fixed member mounted on a unique adjustable connection which provides for close timing and quick follow up. A larger model, available in two sizes of 100 and 150 KVA also is described. Complete specifications are listed.

HOUSEWARE PRODUCTION

Anticipated expansion of houseware production points up the advantages of Federal resistance welding for the fast, low cost application of handles to enameling steel or aluminum pots and pans. Press type welders are used, with dies that permit rapid loading, give production of 500 to 800 handles per hour, depending upon type of handle applied. Cost with one manufacturer is one-fifth previous method.

HOW TO MAKE PROJECTIONS

Interesting and useful information on machines and methods for projection resistance welding is included in a new sixteen page booklet just released by The Federal Machine and Welder Company. There are descriptions of various types of projections, tables of proper measurements for projections and complete data on twenty varieties of welders adaptable for either projection of spot welding.

Several interesting special applications are illustrated. These include an eight-station dial-feed fixture for automatic welding of radar tube assemblies at high speed; a dual head for series projection welding; a special fixture for welding aircraft heat exchangers; several air clamping fixtures for quick loading and unloading of work in welding dies; a machine that automatically welds nails to trim moulding.

Special equipment such as rubber heads, air-lock heads and anti-friction slides also are shown. The book is available on request . . . Bulletin 4520.

FOR CONTAINER MAKERS

A special book of particular interest to container manufacturers is in the list of literature available on request at The Federal Machine and Welder Company. Principal theme is description of a complete steel barrel welding plant. Several special machines for resistance welding a variety of metal containers are illustrated. Bulletin SP **245**

BETTER Grinding Finishes

• • FASTER AT LOWER COST

Coolant Filter Saves Time and Money . . .



Clean coolant is vital for fast, scratch-free grinding. Fostoria Coolant Filters keep cutting fluids clean—filter out the grinding dust, dirt and sludge that clog and dull wheel cutting edges.

Inexpensive and easy to install on each machine, the highly efficient Fostoria Filter insures finer precision finishes, fewer wheel dressings, more production faster. Over 1,000 industrial users are now saving time and money with this modern equipment.

Try a Fostoria Filter on approval—see the difference. Send, today, for the convincing evidence recorded by leading manufacturers.

COOLANT fostoria FILTER

Write for complete facts on Fostoria Localized coolant filtering as used and recommended by nearly all grinder and hone manufacturers.

THE FOSTORIA PRESSED STEEL CORP.
FOSTORIA, OHIO

SEVERANCE CHATTERLESS COUNTERSINKS GIVE MIRROR FINISH . .



If your production calls for perfectly finished seats, you simply can't beat Severance Chatterless Countersinks. In a few seconds, they produce a finish that will stand up to a commercial ground job. Using a standard type, a finish sufficiently smooth for valve seatings may be obtained. Because of their staggered tooth design, they take clean, shearing cuts—thereby eliminating chatter. Available with any angle and in a wide variety of diameters, lengths and shanks. Heavy duty types have tang shanks and may be used with a Glenzer sleeve. Write today for complete facts about how Severance Chatterless Countersinks can solve your counter-sinking problem.



Severance Midget Milling Cutters and special cutting tools of many types are available, with Severance tooth design, for finishing every kind of wood, plastic, metal and alloy. These fast-working tools take sharp bites, throw off clean chips. For best service, order new cutters and send your worn cutters for regrinding to the nearest Severance plant.

Severance

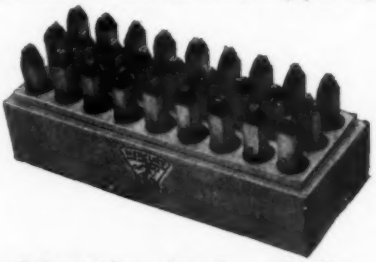
MIDGET MILLING CUTTERS • PRECISION REGRINDING • Severance Tool Industries Inc., Saginaw, Michigan • Plants in Long Island City 1, New York; Detroit 2, Michigan; Fort Wayne, Indiana; Chicago 6, Illinois; and Los Angeles 21, California. In Canada: 60 Front Street West, Toronto, Ontario.



CLEAR, SHARP, completely readable letters and figures are essential when you're putting size, catalog number, part number or any other identification on metal parts or equipment. Mercury Steel Letters and Figures produce these clean impressions on even the toughest metals and give years of service on a wide range of marking jobs.

Mercury Stamps are made of the finest tool steel, with letters and figures accurately cut to produce sharp, easy-to-read markings. Beveled shoulder makes alignment easy, assuring neatness and preventing overlapped figures. The heat treated steel shank is amply strong to withstand severest use.

Mercury Steel Letters and Figures are stocked in a wide range of sizes to meet every need, and special sizes can be made to your specifications if desired. *Write Department B for full details, and outline your metal marking needs for a prompt recommendation.*



Metal Marking Tool Specialists for Over 25 Years

MERCURY METAL DIE AND LETTER CO.

546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

THE POPE PRECISION SPINDLE

for your

DIAMOND WHEELS



You'll get longer life as well as more accurate work out of expensive diamond wheels when you use this POPE Vertical Motorized Spindle with *sealed lubrication*, totally enclosed fan cooled motor and super-precision bearings.

It is designed for the purpose—dynamically balanced, rigidly constructed and runs within very close tolerances. Good finishes are assured.

The POPE Diamond Wheel Spindle has provision for precise and rapid mounting of the wheel. It may be operated at any angle. These spindles are also available with belt drive.

Ask us to mail you Data Sheet No. 14 from which we can supply detailed recommendations and estimates.

POPE

POPE MACHINERY CORPORATION

ESTABLISHED 1940

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

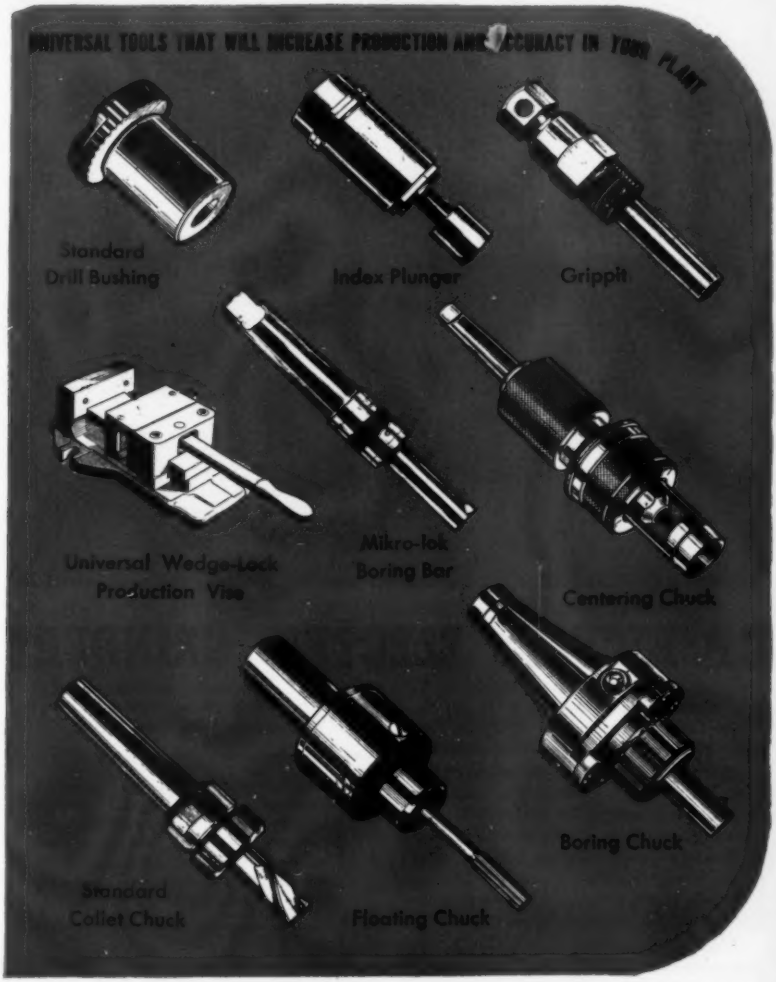
BUILDERS OF PRECISION SPINDLES

Their superhoned bores increase life of tools and drills

You are assured of more accurate, less costly drilling and reaming when you use Universal Drill Bushings. Their bores are precisely honed within extremely close limits of accuracy. Thus, they offer unexcelled resistance to wear and the galling action of chips. Straight and round to within .0003", they accurately guide tools. Knurled or serrated heads afford firm grasp for easy insertion or removal from jigs. Write for complete information on Universal Drill Bushings or any of the other superior Universal tools illustrated on these pages.

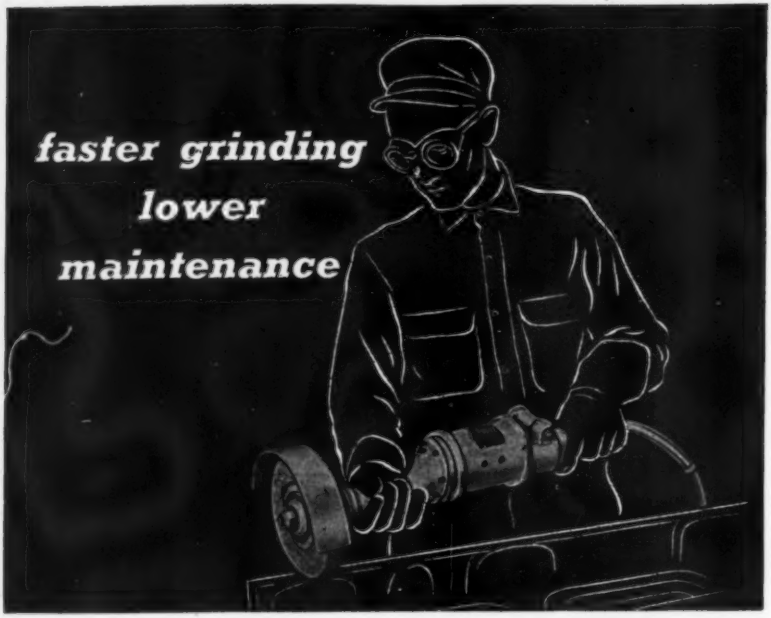


Originator of
Standard Drill Bushings



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, MICHIGAN — Fighter Plane Given by Employees — Employee Bond Deductions



CP HICYCLE ELECTRIC GRINDERS

IN plants where grinding is an important operation, CP Hicycle Electric Grinders afford significant savings in grinding time and grinding wheel life. Because of their high, sustained speed, these perfectly balanced, cool-running grinders remove more metal in less time—minimizing emery wheel wear. Users' records show CP Hicycle Portable Tools to have the lowest maintenance expense of any type of portable tools. For full data, write today for copy of Catalog 900, 2nd Edition.

In addition to Grinders, the complete line of CP Hicycle Portable Electric Tools includes Drills and Reamers, Sanders, Buffers and Polishers, Screw Drivers, Nut Runners, Stud Setters, Tappers, Radial Arms and Accessories.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
HYDRAULIC TOOLS
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N.Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

COBALT-TUNGSTEN ALLOY TIPS

ON CMD

Helical Groove CENTERS

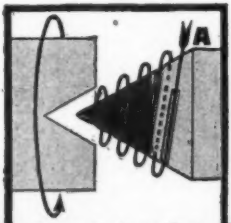


—Your Assurance of *"Red Hardness"*

Under the Most Severe Shop Conditions!

This "Red-Hardness", abrasion-resistant alloy is torch-welded (not brazed) on to the center tip—midway from point as illustrated. Torch welding fuses the cobalt-tungsten alloy with the steel base of the center and assures a new standard of rigidity and long economical service. Mail coupon for circulars on "Red Hardness" Centers and standard Helical Groove Centers.

MAIL COUPON FOR CIRCULAR!



Arrow A shows flow of lubricant around helical groove.

SEND FOR CIRCULAR

CHICAGO MANUFACTURING & DISTRIBUTING CO.
Dept. 11BB, 1928 West 46th St., Chicago, Illinois

Please send circulars on CMD Helical Groove Centers with "Red Hardness" Tips and CMD standard Helical Groove Centers.

NAME .....

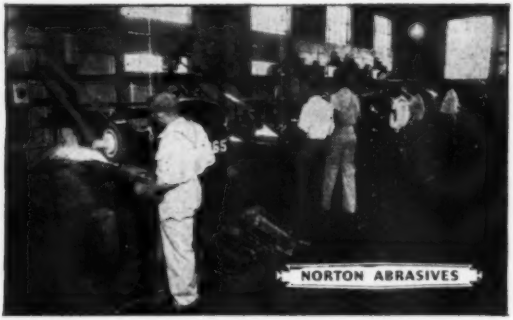
FIRM NAME .....

ADDRESS .....

CITY..... ZONE..... STATE.....

"They shall beat their swords into ploughshares"—ISAIAH II: 4





★ SEE BELOW

SWORDS TO PLOWSHARES

Conversion to peaceful pursuits will bring its own battles—to do things better, faster, cheaper and with less labor.

But there's one modern, speedy, economical method that any metal working plant can so quickly and easily adopt:

Metalite Belts - Idler Backstands

. . . with the minimum expenditure of time and money and no loss of present floor space.

Just install an Idler Backstand behind your present lathe, substitute for the set-up wheel a resilient contact wheel, slip a Metalite Cloth belt over the latter and the pulley on the backstand, and you're off to higher speeds, better finish and sweeping reductions in "cost per piece sanded."

The examples shown in our illustrated bulletin give far more convincing details than we can possibly include in this short text. Just a few lines on your letterhead asking for "Plus Factors" will bring it by return mail.

★ Left: Grinding Machete Blade. Right: Finishing Plow Points.



BEHR-MANNING · TROY, N. Y.
(DIVISION OF NORTON COMPANY)
QUALITY COATED ABRASIVES SINCE 1872

Now! CHECK BORES FASTER more accurately

NO PILOT NECESSARY



DuBo

... that New, Better PLUG GAGE by STANDARD



DuBo Tells More...More Easily

Spherical gaging surface, chamfered, relieved and self-piloting enables DuBo to be inserted easily into bores of extremely close tolerance.

Finger-tip "feel" and control reveal internal conditions at any point in the bore. Light weight minimizes fatigue errors.

Out-of-roundness, taper, belling and dimensional deviations revealed by unmistakable tilt of handle.

May be used in deep bores and close to the bottom of blind bores.

Plastic color signals, Green for Go, Red for Not Go, make identification easy, prevent errors in reading.

Chamfered edges automatically wipe bore and help prepare a clean surface for accurate gaging.

HERE is a radical improvement over old-style, limit plug gages. DuBo is designed for greater ease-in-use, finer precision, more thorough inspection, faster gaging. Its unmatched lightness and balance give finger-tip control and amazing sensitivity in revealing internal bore conditions ordinarily passed over by common cylindrical plug gages.

Write for Special Bulletin

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

PRECISE ENGINEERING FOR PRECISION PRODUCTION

FASTER Driving . . . to EXACT Tightness with Thor



PORTABLE PNEUMATIC
Screw Drivers and Nut Setters

***Speed Unit Operations*—Positive tension control through adjustable clutch attachments enables operators to drive screws and nuts to exact, uniform tightness . . . quickly and surely at full speed.**

As inventors of the first power screw driver, Thor was naturally first to develop a complete line of efficient assembly tools for every application. Today, you can get precisely the right combination of speed, power and control in a Thor tool to drive screws and nuts of all sizes in virtually any location to exactly the required tightness. For detailed data, write for Thor Reference Manual No. 90.

INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. Jackson Boulevard, Chicago 6, Ill.
New York Los Angeles

Thor
PORTABLE POWER
TOOLS
PNEUMATIC
UNIVERSAL ELECTRIC
HIGH FREQUENCY ELECTRIC

BLOW *Hot...*
BLOW *Cold*



RFC HAND-CUT ROTARY FILES are used for surface *roughing* as well as for smoothing. Just an example of the hundred-and-one industrial applications for these men-of-all-work precision tools . . . in rough forming, cleaning, shaping . . . all manner of stock-removal and finishing operations.

Speed and accuracy distinguish the performance of every RFC rotary file. RFC types, in high speed steel or high carbon steel, are heat-treated to suit the hardness of work . . . shaped to fit or form any contour, recess, corner, groove or fillet . . . sized, finished and fitted to meet almost any requirement. Files with a pedigree—of some 20 years of pioneering in this highly specialized field of manufacture!





RFC may be able to help you cope better with that faster production schedule. Start by writing for your copy of the new RFC catalog.

The ROTARY FILE COMPANY
STRATFORD, CONN.

Curtis UNIVERSAL JOINTS...

DRIVE UNIVERSAL CUTTERS



Photo courtesy of Food Machinery Corporation.

Ten heavy Curtis Universal Joints drive the feed-roll shafts on this No. 2 Universal Corn Cutter.

Here in the food canning industry — as well as in the machine tool industry — Curtis Universal Joints are selected for their long life, low maintenance and smooth, positive action.

Whether it be in airplanes, machine tools, or special type machinery for any field, you can be sure of proven performance in specifying Curtis Universal Joints.

More than 20 years of experience in designing joints for out-of-line power transmission or rotation of shafting around corners or at angles, is yours for the asking.

Let Curtis Engineers help you solve such problems. Phone or write us — there is no obligation.

Every universal joint made to Curtis "Standards" is stamped with our Registered Trademark.

Write for technical data and useful Engineering Templates.

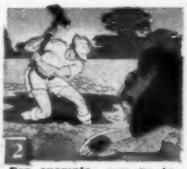
CURTIS UNIVERSAL JOINT CO. INC.

4 BIRNIE AVENUE • SPRINGFIELD 7, MASSACHUSETTS

What will they cook up *next*?



You make alloys by "cooking" several metals together.



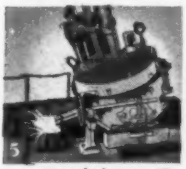
For example, you go to Africa and dig up some rare ore.



Then, you zip over to Turkey and dig up another kind . . .



. . . and push off for India for a third type. Next . . .



. . . you mix 'em exactly right and cook 'em in an electric furnace.



What have you got? STELLITE! A wonderful, useful new alloy.



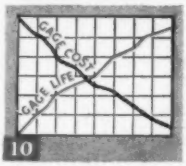
H. A. Woodworth and Stellite engineers put their heads together.



Result! Long-wearing and corrosion-resistant GAGES.



Woodworth Gages of Stellite Cast Alloy outwear steel 25 to 1.



They increase gage life many times—reduce gaging costs.



And, they won't rust or corrode, in storage or in use.



Woodworth Gages made with Stellite set production records!

What Woodworth Products Mean to Industry

PIONEERING in the use of splendid new materials like Stellite is almost an everyday occurrence at Woodworth.

Here's why.

Every Woodworth product must conform to this basic research and manufacturing policy . . . *to make only products which will benefit industry through increased production and reduced costs.*

Since Stellite makes certain Woodworth products more efficient, it is being used. But, if tools and gages made out of *fragments of the moon* were required to speed up production and lower costs, our engineers would strive to find a way to furnish them.

Our always-try-to-make-it-better attitude should be of real help to industries preparing for the coming scramble for postwar markets.

ACCURACY YOU W CAN TRUST

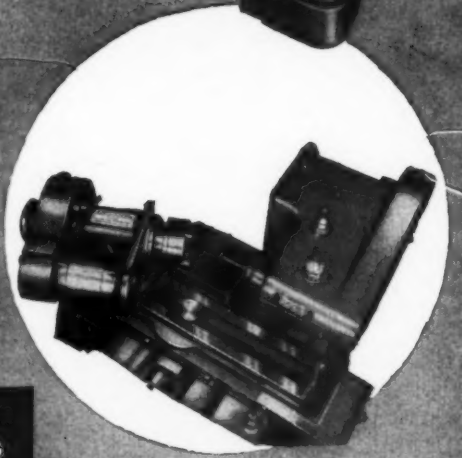
WOODWORTH

H. A. WOODWORTH CO., SALES DIVISION
1300 E. NINE MILE ROAD
DETROIT 20, MICHIGAN

PRECISION GAGES
PRECISION MACHINED PARTS
PRECISION TOOLS

GRENBY HYDRAULIC GRINDING MACHINES





FEATURES

- Infinitely Variable Longitudinal Traverse
- Hydraulic Cross Feed
- Coolant
- Precision Spindles
- Heads Swivel For Angle Work
- Grinding Heads To Convert For Internal Grinding (See Cut)

EG103 SPECIFICATIONS

ork Capacity—3" Dia. x 10" Length
orkhead Accommodates—Collets 1" Max. Hole
—Chucks & Face Plates 4" Max.
oor Space & Wt. 45" Long x 25 Wide—1600 lbs.

THE
GRENBY MANUFACTURING
COMPANY
PLAINVILLE, CONNECTICUT

CROBALT
CUTTING QUALITIES
Remain Constant at High Temperatures



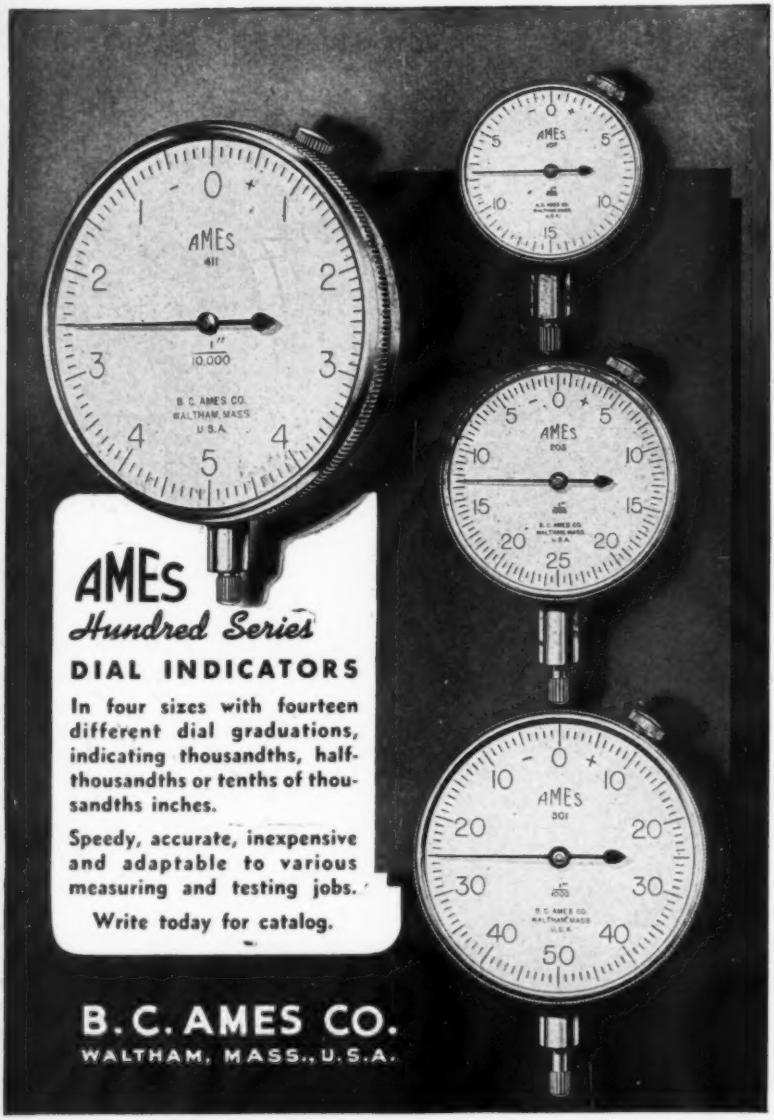
At temperatures up to 2000 degrees, the cutting qualities of Crobalt tool bits remain constant. This allows faster cutting and contributes to increased tool life between grinds.

Crobalt is a balanced, non-ferrous alloy containing principally chromium, cobalt, tungsten, vanadium, zirconium, and carbon. Crobalt's resistance to chipping or breaking is considerably greater than carbides. Engineered for high speed production. Perhaps Crobalt is the answer to your problem—at least it should be worth trying.

Crobalt bulletin No. 45 contains valuable technical information and quotes prices on standard size tool bits—Send for your copy.

CROBALT INC.

1360 North Main St. Ann Arbor, Michigan


AMES
Hundred Series
DIAL INDICATORS
In four sizes with fourteen different dial graduations, indicating thousandths, half-thousandths or tenths of thousandths inches.
Speedy, accurate, inexpensive and adaptable to various measuring and testing jobs.
Write today for catalog.
B. C. AMES CO.
WALTHAM, MASS., U.S.A.



3½" HOLES WITH *Speed* AND *Accuracy*

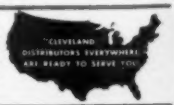
● Typical of the scope and versatility of CLEVELAND Twist Drills. A 3½" hole drilled in a duralumin aircraft landing gear box plate . . . on a production line drill press!

Whether drilling specifications call for holes .0135" or 4" in diameter, there are CLEVELAND Twist Drills to fit. For nearly three quarters of a century the ✧ trade mark has represented uniformly high quality and dependability.

Specify CLEVELAND Twist Drills, Reamers, Screw Extractors, Arbors, Mandrels, Sockets, Mills, Counterbores and Carbide Tipped Tools for all precision production.

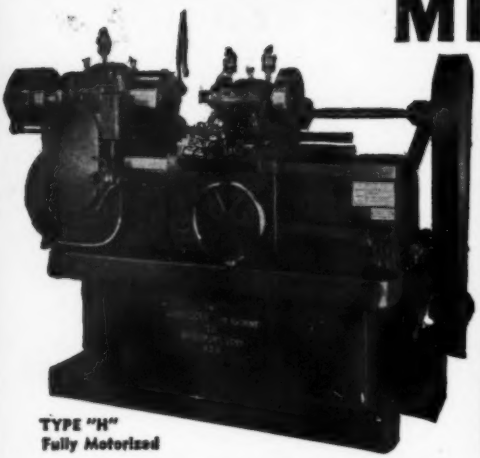


The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND



If You can
CHUCK *it*
You can
THREAD *it on . . .*

COULTER HOB THREAD MILLER



TYPE "H"
Fully Motorized

for
THE RAPID DUPLICATION OF RIGHT OR LEFT HAND THREADS
INTERNAL
or
EXTERNAL

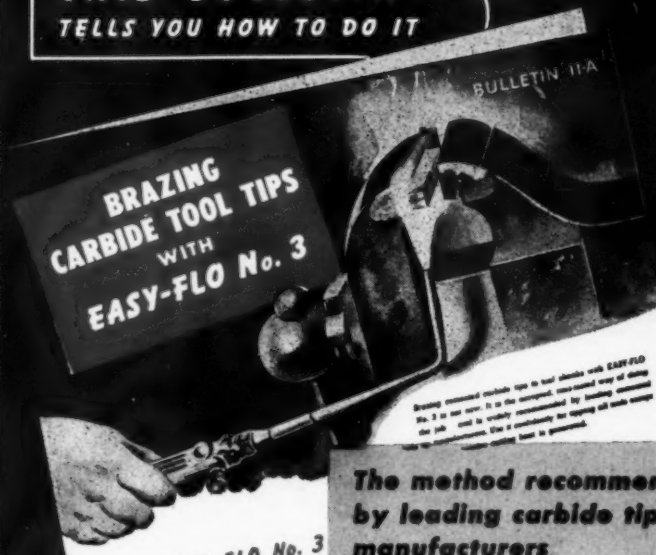
Hob thread work can be handled with high speed and precision on this rigid, simple, fully motorized machine. The range of work it is capable of handling is practically unlimited. Any parts that may be held in ordinary chucks, air operated chucks, or special face plate fixtures can be threaded advantageously. Design of the machine permits accommodation of long work.

Work and cutter spindles are driven by individual motors. A wide range of speeds and feeds is available for threading parts of various materials. Maximum external thread capacity is 7"; minimum hole depends on smallest hob practical.

It will pay you to investigate the profit possibilities of Coulter equipment by writing for further information.

The James **COULTER** *Machine Co.*
BRIDGEPORT • CONNECTICUT • U. S. A.

THIS BULLETIN
TELLS YOU HOW TO DO IT



The method recommended by leading carbide tip manufacturers

The bulletin explains why brazing carbide tips to tool shanks with EASY-FLO No. 3 is fast, reliable and economical.

It tells you how to do the job step by step with each step illustrated. You'll find it easy to follow.

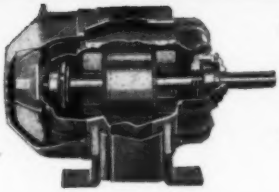
A copy is yours on request. Write today and ask for BULLETIN 11-A.

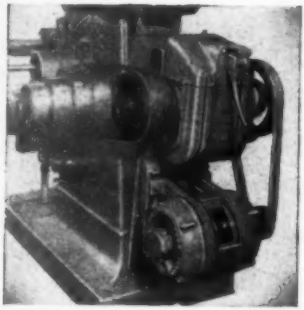
HANDY & HARMAN
82 FULTON ST., NEW YORK 7, N. Y.
Agents in Principal Cities

Speed PRODUCTION UP TO 25% WITH

TORQ *MOTORS AND DRIVES*

FOR LATHES • SCREW MACHINES
MILLING MACHINES • OTHER
STANDARD MACHINE TOOLS





PROMPT DELIVERIES

In most cases we can deliver within three or four weeks. And that means **early** speed-up of your production, thanks to modernization of your present equipment. With Torq drives and motors you may speed production up to 25%, and make the changeover so easily you lose no valuable production time in waiting. You will be prepared for post-war with completely modernized equipment.

ELECTRIC MOTORS: Totally enclosed, fan-cooled, anti-friction bearings.

TORQ-QUA-MATIC DRIVES: 4 selective speeds, 1 to 15 H.P., alloy steel gears, anti-friction bearings. Proven design . . . improves production up to 25%.

NOTE THESE LEADING USERS

Listed here are a few of the leading American War Plants which successfully use Torq Motors and Drives: White Motor, Cleveland Cap Screw, Cutler-Hammer, Republic Stamping, Valley Mould & Iron, H. B. Sacker Mfg. Co., Thompson Products.

Send for free descriptive catalog.



THE TORQ ELECTRIC MANUFACTURING CO.
6605 CARNEGIE AVE. CLEVELAND, OHIO

Staples STANDARD SOLID REAMERS



• It's the greatly increased Carboloy surface, extending full length of the flutes, that makes the difference . . . in the new and exclusive Staples Standard Solid Reamer.

This noteworthy advance means reduced wear—for the entire I. D. is contacted only by Carboloy. Wear strips are unnecessary—for the all-over guide is diamond lapped Carboloy, copper brazed to the alloy steel body. The number of sharpenings per tool is increased.

Scoring or galling, caused by worn flutes, is avoided. The importance of full length Carboloy will be especially seen in reaming cast iron, or any other highly abrasive material.

Lasting precision the full length of the flute is provided by this new Staples Standard Solid Reamer . . . at a price only 15% above conventional solid reamers. Available in diameters 5/16" to 1½". Send for full information on this new Staples Reamer, and catalog of the Staples complete line of Carboloy-tipped circular cutting tools.

STAPLES TOOL & ENGINEERING COMPANY • CINCINNATI 25, OHIO

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS



HIGHER PRODUCTION ASSURED

with

AIR TOOLS

Naturally production increases when hand-held portable tools can be used. Even higher production is assured when the tools are air-operated. This is because **AIR TOOLS** are able to start and stop instantly.

This positive response to operator control is but *one* of their *many* advantages, but it means—that full power is available immediately—that there is no overspin when the tool is shut off—that spotting the next operation is quickly and easily done—that air tools are safer. Briefly it means that production, and especially repetitive operations, can be greatly speeded up with Air Tools.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

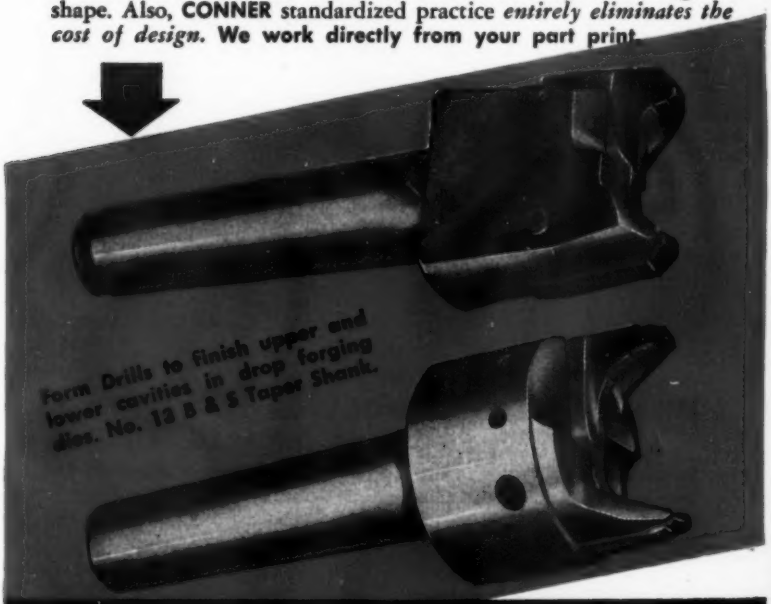
9-574

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

SAVE TIME • • •
by FORM DRILLING

Now- **FORM DRILLS DIRECT FROM YOUR PART PRINT!**

CONNER form drills enable you to drill holes with irregular contours, such as flat bottom holes — holes with one or more tapers on the side — one or more radii in the form, or any other irregular shape. Also, **CONNER** standardized practice *entirely eliminates the cost of design.* **We work directly from your part print.**



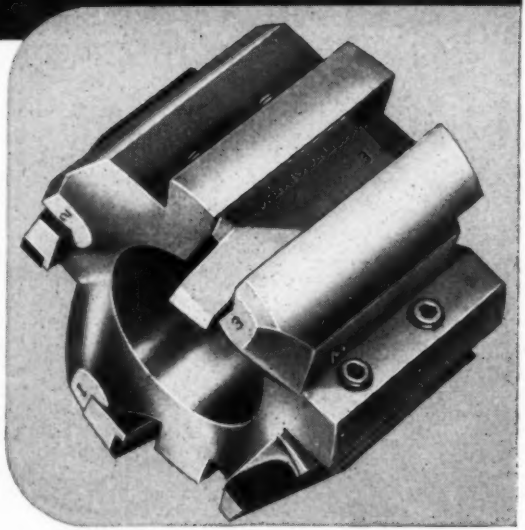
FOR DRILLING LARGE SIZE HOLES
Write for literature on **CONNER'S MULTI-TIP** drill equipment for form drilling—on **CONNER'S** special drilling applications—on **CONNER'S MULTI-TIP** drills for general use.

Conner
TOOL & CUTTER CO.
5555 CONNER AVE.
DETROIT 13, MICH.

"STEP UP" YOUR STEP CUTTING PRODUCTION WITH SUPER'S NEW ROTARY BROACH TYPE CUTTER

FAST, ECONOMICAL STEP CUTS

This new Super Tool can be positioned for step cuts up to ½" or more, giving high rates of metal removal, assuring maximum use of carbide in milling performance, long life and simplification of grinding methods.



IT'S A VERSATILE TOOL . . .
Can Be Used for FACE MILLING

Super's Rotary Broach Type Cutter while designed primarily for step cutting can be used on many jobs where face milling is required. This is accomplished by setting the bits even on the peripheral cutting edges and face.

For the Finest Production Cutting Tools—Specify SUPER

SUPER TOOL COMPANY

Carbide Tipped Tools

2165 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

ACRO





Die set pullers

GONE FOREVER — battered and damaged die sets caused by prying or hammering. **ACRO DIE SET PULLERS** do the job the **FIRST** time. No Delay. Use **ACRO PULLERS** for safe sure separation. They are fast — accurate — positive. War plants using these pullers report savings as high as 50% in time alone.

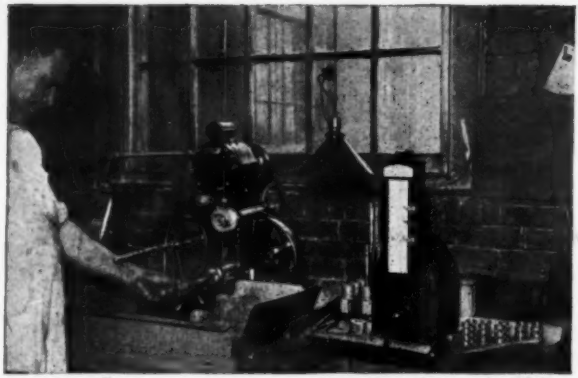
ACRO PULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height.

Order a set today. Convince yourself of the savings you can make in your tool room. **ACRO PULLERS** furnished in three sizes. Write now for more information.

PROMPT DELIVERY

ACRO METAL STAMPING CO.

332 E. RESERVOIR AVE. MILWAUKEE 12, WIS.



Pickering Governors, such as the one shown here, control the speed of prime movers, within 1/100 of 1 per cent, thus accuracy is an absolute essential.



Tolerance .00007"

with Sunnen Precision Honing *Plus* Selective Fitting!



At the Pickering Governor Company special parts are machine reamed to .003" undersize; then sized and finished on the Sunnen Precision Machine to a tolerance of .000125".

This is not an isolated instance. Hundreds of Sunnen Precision Honing Machines are doing similar jobs in hundreds of manufacturing plants.

Let a Sunnen engineer show you how this machine can be used on your jobs — or write for free bulletin.

The SUNNEN Precision Honing Machine

- Handles diameters from .185" to 2.625"
- Produces super-smooth finish of 2 to 3 micro-inches
- Can be used in any metal or plastic except lead and babbitt
- No jigs or fixtures needed
- Does not require skilled labor
- Can be "set-up" for any size in one minute
- Economical to operate

SUNNEN PRODUCTS CO. • 7935 Manchester Ave., St. Louis 17, Mo.

Canadian Factory: Chatham, Ontario

SUNNEN

Typical Jobs



Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.



Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.



Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.



Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

HELLER NUCUTS
CUT AND SMOOTH
ON EVERY STROKE



NUCUT filing
does with one file
what ordinarily takes two

This double-filing action is an outstanding characteristic of the Heller NUCUT File. The result of the patented Heller "Wavy Teeth" design, it is recognized as the most significant improvement in modern file manufacture!

Heller "two-in-one" filing is developed around two sets of *scientifically* positioned teeth, one coarse, the other fine. With every stroke of the file, the coarse teeth take deep, clean, uniform cuts while the fine teeth level the surface smooth—just as though TWO files were working instead of ONE!

It is only natural then that wherever files are used—in the die shop, in the toolroom, in the machine shop—the Heller NUCUT "Wavy Teeth" File can be found helping to do that *particular* filing job *quicker, easier* and *smoother!*

Awarded to the Newcomerstown, Ohio Plant

HELLER BROTHERS COMPANY
America's Oldest File Manufacturers — Good Tools Since 1826
Newark 4, New Jersey • Newcomerstown, Ohio



HELLER NUCUT WAVY-TEETH FILES



Convert Clamping Time Into Production Time

USE KNU-VISE CLAMPS

—that will grip work instantly and release it just as quickly.

Utilize for production the time you now waste in tightening and loosening clamps on work. Only a flick of the lever is required to apply desired pressure and reverse motion to release.

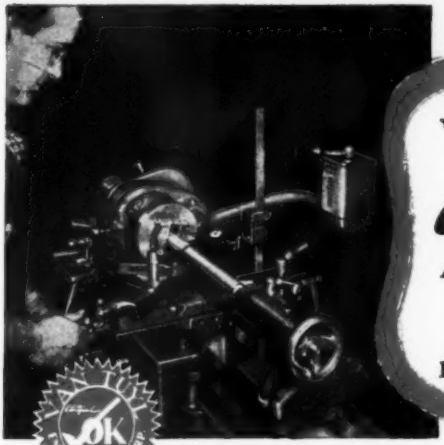
There is a Knu-Vise clamping device for holding any sized part—under any condition—to meet any space accommodations—for welding, drilling, assembly, or fabricating operations.

Let us show you how you can speed production through better clamping.

Send for complete catalog.

KNU-VISE
INCORPORATED

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A NEW SERVICE

for buyers of Machinery and Industrial Equipment

TO SAFEGUARD the interests of the purchaser of machinery and industrial equipment Van Tuyl Engineering Corporation offers an independent inspection service. Every detail is checked to assure the client that:

—specifications are met precisely;
—valuation is as stated by seller;
—equipment is mechanically complete or deviation noted.

And . . .

—if equipment meets the rigid Van Tuyl Engineering standards, it is so Certified.

In addition, Van Tuyl Engineering will, if desired, estimate the cost of reconditioning; see that packing meets the foreign importers' requirements; estimate cost and supervise installation at destination; advise as to type of equipment best suited for contemplated production; and furnish comprehensive plant and initial production engineering.

With a large staff of engineers, specialists in every branch of engineering for industry, Van Tuyl Engineering Corporation maintains offices in Detroit, Los Angeles, Mexico City, and has field engineers in every major industrial center in the United States. Participation in the high production records of leading American aircraft, armament and automotive manufacturers notably qualifies this organization to serve the best interests of buyers of both used and new machinery and other industrial equipment. Inquiries by responsible firms are invited and will be answered in full.

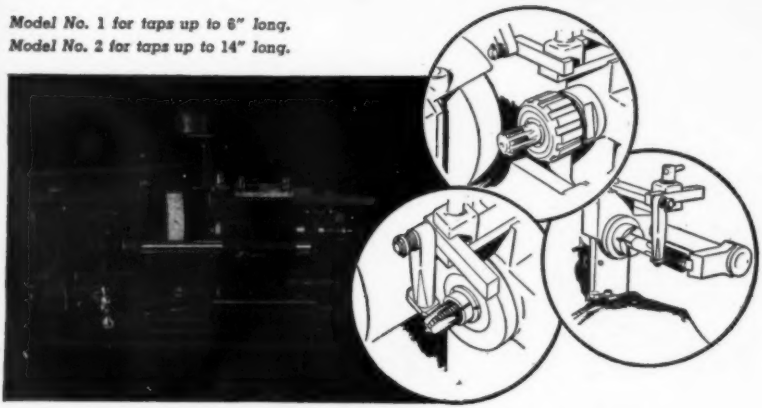
Buy with Confidence on Van Tuyl Certification

VAN TUYL ENGINEERING CORPORATION

LOS ANGELES • DETROIT • MEXICO, D. F.

Address: 8536 Sunset Boulevard, Los Angeles 46, California • Cables: Vantuyl, Los Angeles

Model No. 1 for taps up to 6" long.
Model No. 2 for taps up to 14" long.



BEFORE BLOWING "TAPS" for your TAPS . . . investigate the BLAKE TAP GRINDER

If a tap is *kept sharp* — if a tap is *sharpened properly* — its life will be increased to a point where it need not be discarded until it becomes too short for any job.

The Blake Tap Grinder will keep taps at "original" sharpness throughout their life — it sharpens taps with any amount of relief desired — it handles either right- or left-hand taps with 2, 3, 4, 5, 6, 8, or 10 flutes — it is fast and economical to use — it soon pays for itself by lengthening tap life, reducing broken taps and scrapped work.

Send the coupon for complete details on the two standard models.

No machine is better than the cutting edge of the tool it uses.

Please send me bulletin 544 which gives complete details on Blake Tap Grinders.

NAME_____ TITLE_____ H.

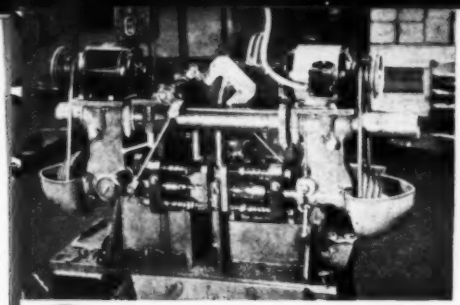
COMPANY_____

STREET_____

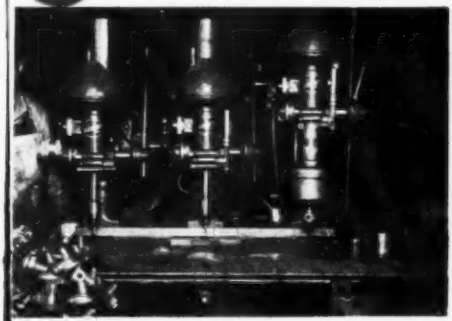
CITY_____ STATE_____

EDWARD BLAKE CO.
634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

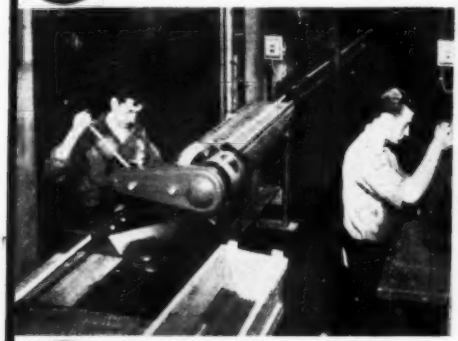
BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — WALTHAM CUTTER SHARPENERS



1 Save the extra cost of special machines, by building your own high-production, specific-purpose units out of standard Delta components.



2 Make old machines useful — economically — by replacing worn-out assemblies with stock-model Delta components.



3 Utilize the portability and compactness of Delta-Milwaukee Machine Tools, to revise or supplement production-line layouts for increased man-hour output.

money-saving ideas on RETOOLING ...with flexible, low-cost

Delta

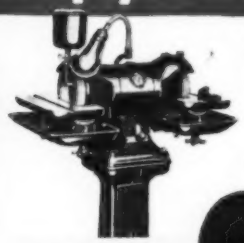
MILWAUKEE

Machine Tools

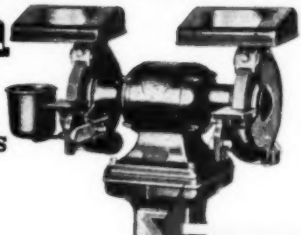
TURN THE PAGE

The flexibility and low cost of Delta-Milwaukee Machine Tools help you cut your investment risk

Delta
MILWAUKEE
REG. U.S. PAT. OFF.
Machine Tools



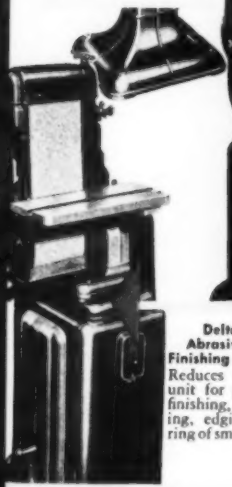
Delta Carbide Tool Grinder
For sharpening tungsten carbide tools, with a remarkably small initial investment.



Delta Grinder with Twin-Lite* Safety Shields
Safety glass shields built right in! Both wheels flooded with light.



Delta 14" Metal-Cutting Band Saw
Saves time and money on many operations—cutting almost any material from carbon steel to asbestos.



Delta 6" Abrasive Belt Finishing Machine
Reduces cost per unit for precision finishing, polishing, edging, burring of small parts.



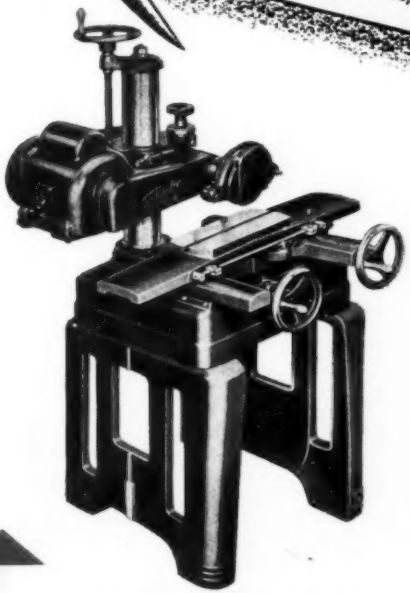
Delta Super-Hi-Speed Drill Press
For precision small-hole drilling. Interchangeable with standard 14" model on regular column. Write for bulletin.

consult your DELTA-MILWAUKEE distributo

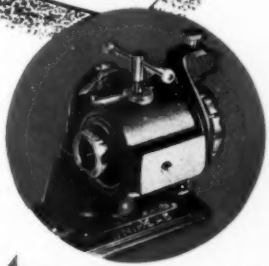
War production experience suggests economies you can enjoy in all these departments – and many more

- ☑ Parts Production
- ☑ Assembly
- ☑ Tool Shop
- ☑ Maintenance Shop
- ☑ Foundry
- ☑ Pattern Shop
- ☑ Shipping Department
- ☑ Research or Experimental

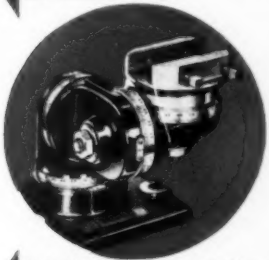
. . . on a wide variety of applications in working metals, plastics, wood.



Delta Toolmaker* Surface Grinder
Designed for ease and speed of surface grinding, tool sharpening, and any grinding operations within its range. Many advantages that help assure you of creditable performance. 7" x ½" wheel; 1¼" bore. Table surface 5¾" x 13".



With the Unihead,* and the tool and cutter grinder attachment, this machine becomes the latest development in Tool and Cutter grinding.



With the Univise* — and the coolant attachment — this machine serves as a dependable, accurate Chip-Breaker Grinder for grinding the chip-breaker groove on carbide-tipped tools.

*TRADE MARK REG. U. S. PAT. OFF.

regarding priorities and deliveries

TURN THE PAGE



FREE 76 page Blue Book

helps you visualize the almost unlimited money-saving applications of

Delta-Milwaukee Machine Tools

Here is a stimulating book that pictures and describes a wide range of applications using Delta-Milwaukee Machine Tools — actual, detailed case histories which give your production men a running start on your own special problems in working metals, plastics, or wood.

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This practical approach to the uncertainties ahead holds your capital investment to a minimum. Delta cost savings are due to modern production methods applied to a large volume of standard models — not to short-cuts in quality.

Also available is a catalog of flexible, low-cost Delta-Milwaukee Machine Tools.

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M-11

THE DELTA MANUFACTURING CO.
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Please send me my free copy of the 76-page Blue Book and catalog of low-cost Delta-Milwaukee Machine Tools.

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Delta Floor-Type Multiple-Spindle Drill Presses
4-spindle model illustrated. 2-spindle model also available with one-piece table. Floor types with sectional tables: 3-, 4-, 5-, 6-, and 8-spindle models.

Delta Power-Feed Drill Presses
17-inch single-spindle drill presses available in 24 different models.

Delta 14" Floor Type Drill Press
Provides *both* self-aligning drive and free-floating spindle.

These quality features minimize depreciation of your Delta-Milwaukee Machine Tools

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2. Pre-loaded bearings.
3. Precision-bored bearing seats.
4. Balanced pulleys.
5. Precision-ground shafts.



Delta Cut-Off Machine
Three models—with abrasive wheel, for cutting steel; with steel blade, for cutting plastics and non-ferrous metals; with cross-cut blade, for cutting wood.

The mark of a GOOD File



FORD—America's oldest manufacturer of rotary files and cutters—producer of the COMPLETE line—devote their entire attention to the one job of making better rotary cutting tools. Write today for complete information.

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746 W. First Street • Davenport, Iowa

HAND CUT FILES • GROUND FROM SOLID CUTTERS • CARBIDE CUTTERS



HARDINGE STANDARD CIRCULAR CUT-OFF TOOLS

for Brown & Sharpe machines

HARDINGE Precision Ground Circular Cut-Off Tools are available for No. 00, No. 0 and No. 2 Brown & Sharpe Automatic Screw Machines.

These Cut-Off Tools have blade thicknesses in relation to the stock diameters which can be cut-off on the above machines. With our literature, you can design your form tools with a breakdown section to match the standard Cut-Off blade width.

The distance from the holder side of the Cut-Off Tool to the Cut-Off blade is held to a close tolerance; therefore, these Cut-Off Tools can be changed without readjusting other tools in the set-up.

HARDINGE Circular Cut-Off Tools reduce tool inventories and set-up time—increase production.

Write for literature giving complete dimensions and prices.

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PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

DE WALT offers cut-off power to spare!

- This machine cuts wet with coolant or dry if desired.
- It cuts off wide stock and odd shapes.
- It also cuts metals on an angle.



POWER is the keynote of the new DeWalt "Wet-Cut" Heavy-Duty Metal Cutting Machine. Its 15 H.P. DeWalt-built motor, driving an 18" diameter abrasive wheel or steel saw blade, makes it possible to "walk" through the toughest kind of metal. It is this same power that keeps abrasive wheels operating at a constant speed, thus increasing wheel life and accuracy of cut. It is power like this that saves time and lowers cutting cost.

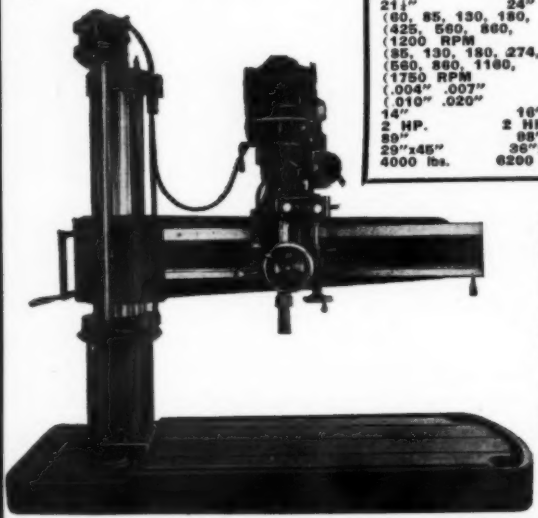
If you have a heavy-duty metal cutting job to do, investigate this DeWalt. Write for full information.

DEWALT PRODUCTS CORPORATION

2311 FOUNTAIN AVENUE LANCASTER, PENNA.

CANEDY-OTTO
RADIAL DRILLS

USED THE WORLD OVER



SPECIFICATIONS:

	8" Column 3' Arm	11" Column 4' Arm	11" Column 5' Arm
Drills to the center of circle on base or table	73½"	96"	120"
Length of arm	3'	4'	5'
Greatest distance from spindle to base	43½"	48"	48"
Minimum distance from spindle to base	9½"	15"	17"
Minimum distance from spindle to column	10½"	10"	10"
Traverse of spindle	9½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	36½"	48½"
Traverse of arm on column	21½"	24"	24"
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1180, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	89"	98"	98"
Working Surface of Base	29"x45"	36"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.

Canedy-Otto has been the manufacturer of first-class, high-grade drilling units since 1892. These units are available in single spindle, multiple spindle and radial.

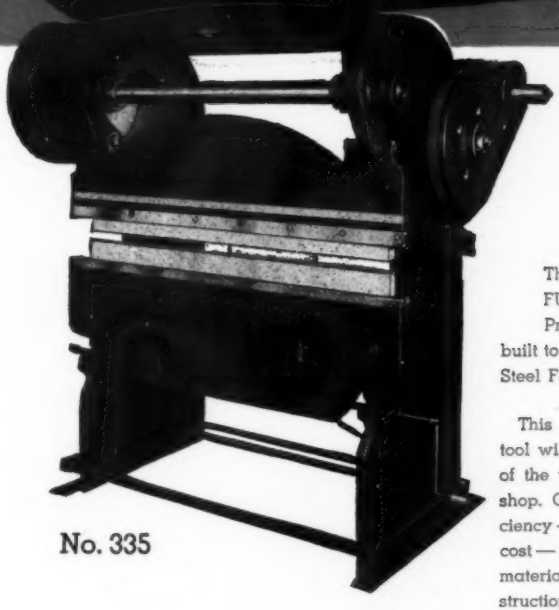
We can help you solve your drilling problems. Send for information on our complete line.

Early delivery possible.

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Powerful CHICAGO STEEL PRESS BRAKE



No. 335

This No. 335 is a POWERFUL, rugged, inexpensive Press Brake, designed and built to the standards of Chicago Steel Forming Presses.

This money-saving production tool will handle 40 to 50 percent of the work done in an average shop. Greater speed, higher efficiency — much lower operating cost — plus the highest quality material and sturdy welded construction as in our large machines.

3 sizes—capacities 10 gage, 4 ft. long; 12 gage, 5 ft. long; 14 gage, 6 ft. long. Powered by 1½ h.p. motor.

We also build special machines for intricate bending operations.

Take advantage of our experience of over 40 years by sending to us any difficult bending problem you have.

WORLD'S LARGEST MANUFACTURER OF HAND BENDING, POWER BENDING AND POWER PRESS BRAKES

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SEND FOR NEW BOOK "FORMING PRESS DIES AND THEIR USES"

PRODUCTO

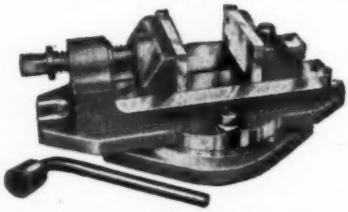
MODERN MACHINE VISES

For **EVERY** *use...* **EVERY** *day... in* **EVERY** *Shop*

Producto machine Vises embody all modern refinements in design, construction and material . . . are built not alone for normal shop operations but also to meet the toughest conditions of precise production.

SCREW ACTING VISES, 4½", 6", 9" capacity, Plain and Swivel types.
HARDENED AND GROUND TOOL ROOM VISES, 2 sizes, for finest tool work.
CAM LOCK VISES, 4", 5", 7", for Production Milling and Drilling operations.
SELF-CENTERING SHAFT VISE for holding shafts or spindles.
QUICK-LOK VISES, 3" and 4" capacity, inexpensive and useful.

General purpose 4½ inch plain and swivel vise, hardened and ground ways.



Send for bulletins which cover all Producto Vises.

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Deep-drawn containers produced at high speed and less cost with . . . . . MULTIPRESS

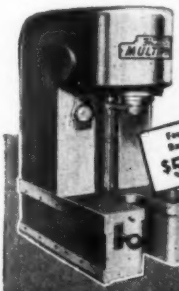


Buckeye Stamping Co. Saves 66% Floor Space . . . 33% on Initial Investment

MULTIPRESS *blanks and draws* seamless metal cans and boxes at the rate of one every second, in The Buckeye Stamping Company plant at Columbus, Ohio — a blanked and formed container with each complete ram stroke! And along with this high-speed production, MULTIPRESS saves *two-thirds* of the floor space previously used . . . features a relief valve that prevents damage to dies in case work jams . . . requires less experience for skillful operation . . . reduces fatigue and increases safety for the operators. *And cost of the complete MULTIPRESS installation was one-third less than equipment formerly required!*

These MULTIPRESS savings are typical. Its performance in scores of plants on dozens of operations proves that MULTIPRESS is Industry's New Tool of amazing advantages.

MULTIPRESS is a compact, bench-size, oil-hydraulic machine tool, built in four, six and eight-ton capacities. Ram pressures are regulative from 300 pounds to capacity . . . ram strokes from 1/32-inch to capacity.



Get full details on MULTIPRESS and its remarkable accessories—including indexing tables . . . straightening fixtures . . . automatic cycling controls . . . *and the revolutionary* VIBRATORY RAM ACTION *all Industry is talking about!* Write today!

The DENISON Engineering Co., 1184 Dublin Rd., Columbus 16, O.

DENISON EQUIPMENT for APPLIED Hydroilics



"BASIC UNIT + PARTS" PLAN

Gives you EXACTLY the High Speed Production Lathe you need – *at Lowest Cost*



(LEFT) BASIC UNIT OF THE MINNEAPOLIS PRODUCTION LATHE to which you can add only the equipment needed for your particular production "set-up". 4 different drives.

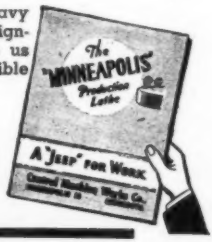
(RIGHT) A SET-UP "TAILOR-MADE" FOR CUSTOMER'S NEEDS

Here is a "set-up" as ordered by a customer, including Basic Lathe with All-Electric Multi-Speed Drive (50-1500 RPM) — hollow stationary air Cylinder — rack and pinion Cross-Slide with longitudinal power feed — 6-station heavy-duty Turret with power feed — also complete special tooling.

SMALLER INVESTMENT — Lower Production Costs

The "MINNEAPOLIS" Production Lathe is extremely adaptable to any production set-up, particularly second operation work. Its simplified design and ease of control enable inexperienced operators to turn out high speed volume production.

The "MINNEAPOLIS" has 2¼" collet capacity, 14" swing, heavy duty spindle assembly. It is backed by more than 50 years designing and manufacturing experience. Send for literature — write us your production problems. Send sample part or drawing if possible — let us quote you on a "tailor-made" lathe for your work.



CENTRAL MACHINE WORKS CO.

Machinery designers and manufacturers since 1890

1235 Central Avenue, Minneapolis 13, Minnesota

Demanded

FOR ALL-OUT WAR EFFICIENCY

Preferred

FOR PEACETIME RECONVERSION



PUTNAM *Hi-Speed* END MILLS

LONG NOTED for their exceptional performance, these longer lived, finer cutting end mills took the toughest wartime milling operations in stride. Now they're ready to meet the challenge of even greater efficiency and economy of operation demanded in reconversion.

Ample stocks of standard Putnam End Mills—of every size and type, numbering nearly 800 separate items—are now being maintained at distributors and factory, making possible instant delivery to you of the end mills you require now. Call your Putnam distributor today.

END MILLS • HEAVY DUTY SHELL END MILLS • T-SLOT CUTTERS • CORNER ROUNDING END MILLS • REAMERS • COUNTERBORES

PUTNAM TOOL COMPANY

2983 Charlevoix Ave. • Detroit 7, Michigan


Say, George — What's this about Sentry Diamond Block controlled atmospheric high speed steel hardening?
Well, Ed — I've used Diamond Blocks and Sentry Furnaces for years. You just can't beat that combination!
SENTRY Diamond Blocks produce uniform, maximum hardness without scale or decarburization on all types of high-speed and high carbon, high chrome alloy steels. Work is clean; close tolerances maintained. Furnace may be operated with perfect results by the youngest apprentice.
Used by leading industrial companies. Economical — clean — quick heating — correct hardness — no decarburization — sizes and capacities to fit your needs.
Investigate! Write for bulletin 1020-6D3.
SENTRY MODEL "Y" ELECTRIC FURNACE
Sentry
"Always on Duty"
The Sentry Company
FOXBORO, MASS., U. S. A.
Sentry DIAMOND Block



Much of America's wheel dressing on standard grinding machines is done with these standard wheel dressing diamond tools. In addition to the standard grinding machine dressers shown, the Wheel Trueing line includes dressing tools of every kind for standard thread grinding machines, turning and boring tools, radius forming tools and gage tools.

These tools are the result of many years of study and research on regular work, under actual shop conditions. These studies have been concentrated almost exclusively upon diamond behaviour and diamond characteristics in relation to wheel and work, for, the diamond, being the active element, is the all-important element in any diamond tool.

The logical result of this research and development is that Wheel Trueing tools have been brought to a degree of perfection which many users consider to be the highest in the diamond tool industry.

If you use standard wheel dressing diamond tools in straight or form grinding, thread grinding, turning or boring, radius forming or gaging, send for Wheel Trueing's free illustrated booklets dealing with these various types of standard tools.

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3200 W. Davison Avenue • Detroit 6, Michigan

CANADIAN OFFICES and PLANT
[illegible] • Windsor, Ontario

THE ADAMANT TOOL COMPANY
Eastern Division of Wheel Trueing Tool Co.
467 Bloomfield Avenue • Bloomfield, New Jersey

Allison
COLLET CHUCKS



Above is Allison Indexing base mounted with an Allison #1 chuck doing second operation work.

Model #1 for 1 ½" 8 - thread spindle lathes — with ⅞" collet capacity is unsurpassed as a combination chuck for either first or second operation work.

Allison TOOL & ENGINEERING COMPANY
4031 Whittier Blvd., Los Angeles 23, Calif.

WRITE FOR NEW ALLISON CATALOGUE — SEE YOUR LOCAL DISTRIBUTOR



GRINDS 66% FASTER
AND GRINDS 'EM FLUSH

THIS manufacturer of lift trucks was using straight wheel grinders to finish welds of sub-assemblies. Operators had difficulty in holding wheels on welds and preventing wheels from digging into the plate.

"It's work for a vertical grinder with 6" flared cup wheel," suggested the Rotor Application Engineer. Rotor Powerplus Grinders were installed. Results:

66% faster grinding because it's easy to hold wheel on the weld and make every r.p.m. count.

Smoother finish because flat surface of wheel doesn't dig into plate. Finished surface is flush.

The Rotor Application Engineer can be a valuable ally in boosting *your* production. Call him for advice anytime.

Yours for better grinding faster,

AIR O'TOOL



THE ROTOR TOOL CO.
CLEVELAND OHIO



UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

Continental
CUTTING TOOLS

Boring Bars and Tools
Broaches
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The *Right* Tool Where and When You Want it



CONTINENTAL *Counterbore sets . . .*

. . . consisting of carefully selected variations and sizes to provide the most practical and economical combinations for toolroom use . . . are proving favorite cutting tools in all kinds of machine shops. Continental interchangeable counterboring and spotfacing tools have a wide range of uses. Two standard sets are shown below. Write to Continental today for details.



Above: Set No. 2, for the average-size toolroom.

To right: Set No. 3, for general needs of larger shops.



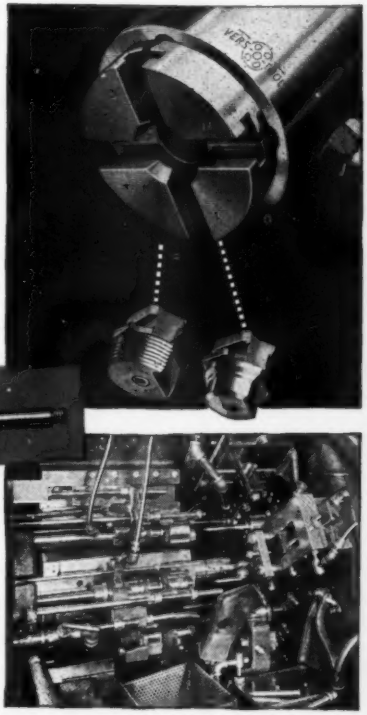
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DIVISION OF EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

How you can CUT COSTS with the VERS-O-TOOL

Into the *same* self-opening *head* you can insert ground thread circular chasers, or circular cutters, for end turning, end forming, recessing, knurling, burnishing or combination cutters for threading and forming.

Then you can insert reground tools, mounted on blocks, in *one minute*, without disturbing the setup. No "trying for size" needed—the first piece is production.

And finally, ground thread circular chasers and circular cutters last 10 to 50 times longer—they may be reground through 270° circumference.



Three Vers-o-tools—two for threading and one for forming—are used to finish the stainless steel valve stem shown, on an Acme-Gridley Bar Automatic.

Job produced at new low cost—through money saved on speed and precision of work, lower tool investment and longer tool life.

Catalog D-42-C gives complete information

The NATIONAL ACME CO.

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COLLETS AND PUSHERS

The design, materials and methods of processing GENUINE Acme-Gridley Collets and Pushers are vital to continuous low-cost performance on your Multiple Spindle Automatics.

Bulletin CP-45

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Live Centers



Standard shanks with Morse tapers carried in stock send us your specifications and blueprints . . . we will see that your job is set up with the right LIVE CENTER.

STURDIMATIC
TOOL COMPANY

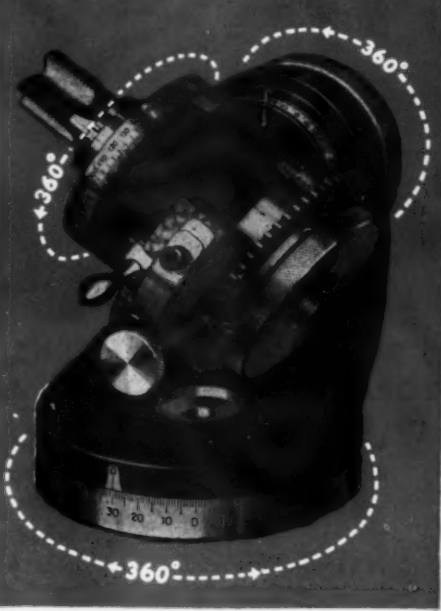
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Cut Tool Maintenance . . . Reduce Manufacturing Costs with The CLEVELAND UNIVERSAL INDEXING HEAD

Now you can regrind your tools . . . in your own shop . . . on any surface grinder . . . in a fraction of the time usually required. Maintaining your tools in tip-top shape, with factory precision regrinds, will help reduce your manufacturing costs.

360° graduations in three planes enable you to regrind or sharpen your tools with any desired angle or cutting edge. Automatic Indexing, provided with a vernier adjustment, permits the re-establishment of concentricity on tools where one or more cutting edges have been unduly worn or damaged.

Only the Cleveland Universal Indexing Head provides three plane 360° settings *plus* compensating automatic indexing. Now available from stock at a *new reduced price.*



New Bulletin Available

Write today on your business letterhead for copy of the new bulletin on the Cleveland Universal Indexing Head. See how you too can reduce your tool maintenance costs. There's no obligation.

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4-TON CAPACITY
BENCH PUNCH PRESS



STAMPS, CRIMPS, MARKS, PUNCHES, RIVETS, FORMS – HANDLES MANY SPECIAL OPERATIONS

benchmaster—known for quality bench machine tools—aids high speed production with a versatile inclinable 4-ton capacity bench punch press.

For Light Sheet Metal, Plastics, Etc.

285 strokes per minute • Die Space: 4¾" when Ram "Up" • Ram Adjustment: 1 inch • Bolster Plate: 6"x 8" • Height: 25" • Weight: 185 lbs. • Motor: ⅓ H.P. • $127.50 F. O. B. Factory (less motor)

benchmaster tools

benchmaster manufacturing company

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HERE'S A TESTED COLD-TREATING PROCEDURE...

A Simple Treatment that Saves this Manufacturer Time and Money in the Stabilization of Gauge Blocks, Lapping Flats, etc.

1. Heat treat as usual.
2. Subject to sub-zero temperatures in Deepfreeze —120° F. Industrial Chilling Machine for period of six hours.
3. Remove and let return to room temperature.
4. Hold at room temperature for period of six hours.
5. Repeat cycle six times.

Result—Transformation of Austenite into Martensite complete; cause of distortion eliminated in fraction of time required by traditional age hardening method.

Drilling and Tapping Operations Completed Without Tearing... Machining Done Without Distortion

This manufacturer experienced considerable difficulty in the production of hydraulic valves for aircraft. Drilling and tapping operations caused valves to tear; general machining caused excessive distortion.

Cold treating was recommended. Valves were subjected to a simple, inexpensive treatment in a Deepfreeze Industrial Chilling Machine. The result was outstanding. Both tearing and distortion were completely eliminated.

Today, by having all valves cold treated, production cost has decreased, production rate increased, and valve quality greatly improved.

Cold Treating Aids Industry in Many Ways...

Cold Treating is being used with equally successful results for such purposes as hardening, stabilization, shrink-fit assembly, testing, etc. For complete information on the possibilities of applying cold treating to your production, contact Deepfreeze Engineering Service. Your inquiry will not obligate you in any way.



FREE! Valuable Production Help...

Get this 40-page Deepfreeze Booklet containing the latest cold treating information, including performance data stories, tested procedures, etc. All of this information can be used to improve your production. Send for your free copy today.

Only Deepfreeze products are made like "Deepfreeze"

Deepfreeze

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ELIMINATE

the Time Consuming

ELEMENTS

in Short Run Piercing

Don't stop long run jobs to set up for short run piercing jobs. A Wiedemann Turret Punch Press can do it with greater accuracy . . . at long run low cost.

Don't interrupt long run production to make 1 or 10 or 100 pieces of a kind, panels, chassis, outlet boxes, special gaskets, louvres, copper buss, and other pierced sheet metal parts. Use a Wiedemann!

A WIEDEMANN *Simplifies*

EVERY COSTLY PIERCING OPERATION

★ Layout time is completely eliminated as greatly reduced because of easily operated material positioning gauge tables . . . only one man is needed to handle the largest sheets in the press.

★ Conventional equipment takes 15 or 20 minutes to change punches and dies. With a Wiedemann, punches and dies operate on an easily rotated turret . . . a few seconds is all that is required to rotate turret from one punch to another.

★ 11 to 32 dies at your fingertips for instant piercing . . . all dies are locked into position by means of index pins after correct dies are located on turret.

★ No sheared punches or dies from inaccurate set-ups . . . holes are punched clean.

★ No waiting for die set-up man. A Wiedemann is always ready to run without tearing down any set-up.

★ Long run jobs can be started on your Wiedemann while production dies are being made.



Send today for Wiedemann Bulletin No. 52 to get the complete story of Short Run Piercing Economy.

WIEDEMANN MACHINE COMPANY

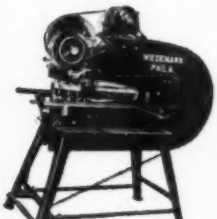
1831 SEDGLEY AVENUE
PHILADELPHIA 32, PA.



With a Wiedemann Type R-7, punching is done either directly from blue prints or from charts without any layout work being necessary, merely by turning two handwheels to obtain accurate X and Y coordinate settings.

This high speed positioning of material is accomplished on a ball bearing spacing table for sheets up to 50" wide by 100" long. Any point on sheets up to ¼" thick can be located under the punching station for piercing openings, or making louvres or knock-outs.

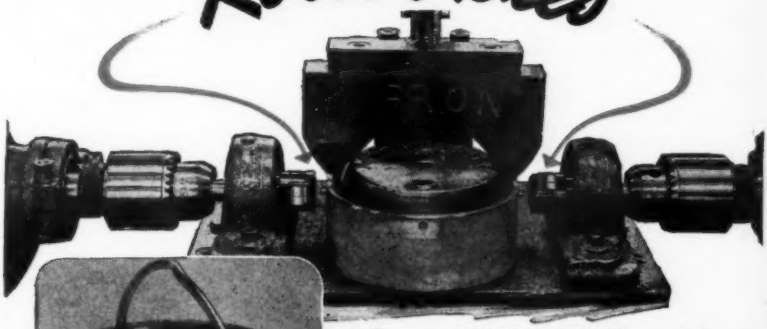
There are no stops to set . . . from 12 to 32 stations operate on an easily rotated turret for instant piercing. Changing from one punch to another is a matter of seconds . . . practically instantaneous.

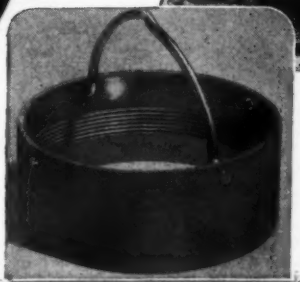


The R-4P Power Driven Turret Punch Press is furnished with 12 punches and dies up to 1¼" diameter, mounted in a revolving turret. An accurate, positive indexing device locks the revolving turret, when the punch and die selected for use are located centrally under the ram. This locking and unlocking is done by a small lever shown on the side of the machine; this lever being interlocked with the clutch trip mechanism to prevent operation of the machine unless the turret is properly positioned and the index lever locked in place.

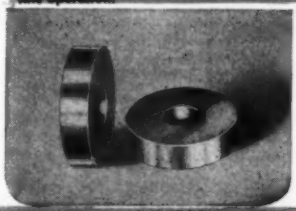
"HARDSTEEL"

Roller Dies





Above—Thread protector after flanges have been spun on ends of handles. Below—Hardened Roller Dies used on this operation.



Solve a "GALLING" problem

In spinning flanges on the ends of the handle for this thread protector, the "galling" condition with ordinary tools was so bad that tools had to be reground or replaced after completion of 1,200 to 1,500 pieces. When "HARDSTEEL" roller dies were substituted, a minimum of 45,000 pieces was produced from each set of dies—with *no regrinding!* This was made possible by the extreme resistance of "HARDSTEEL" to heat and abrasion—a quality which has meant increased production and lower costs on thousands of machine tool operations.

Two "HARDSTEEL" roller dies are mounted in tool holders inserted in spindles on each of two opposed horizontally mounted drill presses. Spindle speed is 2,000 R. P. M. Work is hand fed, the handle and body held in place by special dies.

Learn to drill hardened steels without annealing. Write for the "HARDSTEEL" Operators Manual. Also inquire about "HARDSTEEL" as a metal for special tools or parts that must meet unusual conditions of service.



"HARDSTEEL"

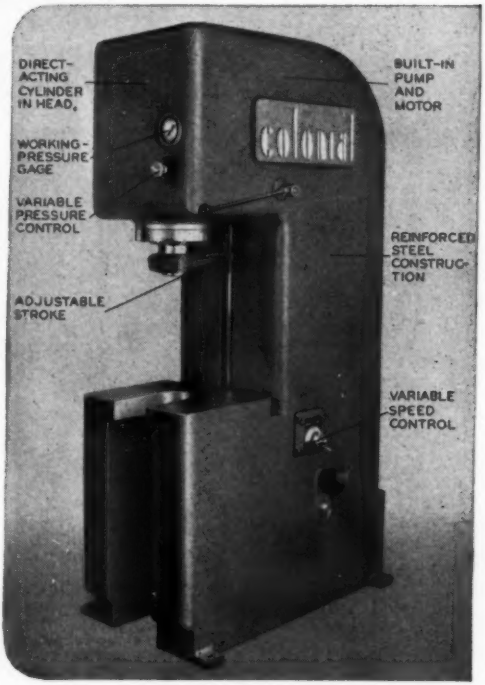
DRILLS • TOOL BITS • SPECIALS

BLACK DRILL CO. • [illegible]

ANNOUNCING-----

Colonial

Hydraulic Standard ASSEMBLY PRESSES



Companions to Colonial's line of standard Broaching Presses and Straightening Presses, these ultra-modern all-hydraulic units are characterized by exceptionally smooth yet powerful action, due to use of the exclusive Colonial hydraulic pressure system, with direct acting cylinder built into the machine head, etc.

Capacities: 15, 20, 35, and 50 tons.

Stroke: Adjustable, 12 in. maximum.

Speed: Adjustable, 60 to 180 inches per min. max. on working stroke, 120 to 360 inches per min. on return stroke (depending on machine size).

Pressure: Infinitely variable, External adjustment. Pressure gage indicates exact pressure. Max. Press. 1000 to 1500 lbs. per sq. inch depending on size.

Floor Space: Only 29 x 50 inches on largest model.

For Complete Details, ask for Bulletin PA-45.

colonial BROACH COMPANY
DETROIT 13, U.S.A.

Broaches - Broaching Machines - Broaching Equipment

The Leader in it's field

MODERN SELF-OPENING STUD SETTERS

Used by practically every automobile, truck, tractor, diesel engine manufacturer and others with studs to set in quantity.





As the action of the tool is positive and automatic, it can be operated in any position with either air or electrically operated portable tools. It can also be used in a drill press, where it is possible to drill and tap the holes and set the studs in successive operations.

The three simple MODERN steps to speed, economy, and convenience in stud setting are illustrated at the right.

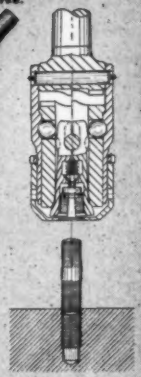
At the top . . . jaws open to take the stud.

Middle . . . driving position, jaws locked on stud.

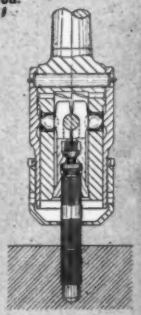
At the bottom . . . stud driven to full depth. The stop collar contacts the work and releases the clutch. Lifting the tool opens the jaws.

The tool revolves in one direction, no reversal, for the complete job.

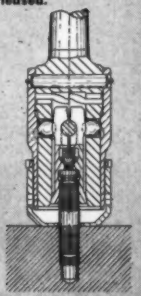
Tool brought to position over stud, about to begin drive.



Start of the drive, with tool engaged on the stud.



Drive completed, with clutch released.



Write for detailed information on the Modern Stud Setter. You will be interested in how and why it provides a proved means for stepping up your production.

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK



Use precious man-hours for drilling . . . not just for hauling and heaving. Take one of these Stanley Heavy Duty Electric Drills to the casting, point it at the punched center and pull the trigger. Comfortable grip-switch handles give quick, easy control. Holes are drilled clean and true . . . and a time-wasting, man-wasting handling job is eliminated.

Stanley Heavy Duty Electric Drills operate from standard power lines, AC or DC current . . . sizes all the way from ¼" to 1". Write for Electric Tool Catalog showing complete line. Stanley Electric Tools, New Britain, Conn.

STANLEY

STANLEY ELECTRIC TOOLS

This huge marine cargo drive is typical of the unusual machining and assembly jobs that are handled every day at Warren City. One of the best-equipped heavy steel fabricating plants in the world, Warren City's facilities include more than 600 separate pieces of large-capacity equipment. These include planers, shapers, milling machines, lathes, boring mills, drills, cranes, automatic welders, grinders, flame cutting machines, stress-relieving furnaces, and extensive facilities for X-ray and other types of testing. Send for illustrated brochure, with complete listing of our facilities and equipment.



NEED A LIFT ON YOUR HEAVY STUFF?

IF IT'S STEEL—and you can *move* it—we can make it! Our seven-million-dollar plant in eastern Ohio is one of the most modern and complete shops in America for the fabricating, welding, machining and assembling of heavy machinery, parts and equipment. Our experience in the advanced welding techniques which have been developed during the war has already proved highly valuable to our customers. Our ability to re-design heavy steel castings into practical modern weldments has effected great savings in weight, bulk and cost, in addition to substantial gains in strength, production speed, freedom from flaws, and ease of testing. If you have a problem that weldments might solve, or a heavy job of any kind that your own plant is not now in position to handle, put the matter up to our staff of practical-minded engineers. They'll gladly study your needs and give you their honest recommendations.



WARREN CITY MANUFACTURING COMPANY ★★★

DEPARTMENT I • WARREN, OHIO

Subsidiary of Graham-Paige Motors Corporation

TWO HEADS
ARE BETTER THAN ONE
IN MULTIPLE PRECISION GRINDING



When Fitchburg engineers put their heads to the "grindstone" to develop a method that would cut costs on precision grinding as multiple tooling has on machined work, they emerged with a revolutionary idea. This new design not only makes other equipment obsolete.— it also prevents its own obsolescence by its unique engineering features!

The basis of this Fitchburg method is an independent standard interchangeable grinding head which may be mounted singly or in multiples on standard or special equipment, and may be regrouped and remounted on standard machines or on new special bases, for operations other than the one originally specified. Mounted singly, it can perform more jobs than was thought previously possible — straight or bevel gears, internal or external gears, etc. — due to its independent positioning and its ability to be set at any angle the work requires. Mounted in multiples, its production uses are even greater.

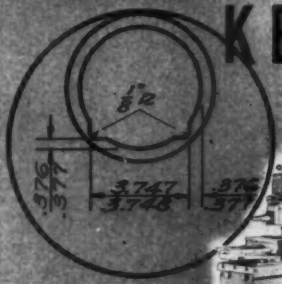
THE HEAD. *The Bawgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

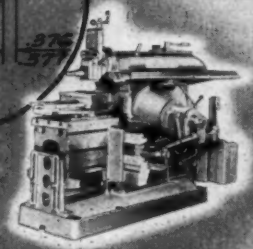
THE BODY. *This Fitchburg Double-Head Grinder and Polisher for Gear Shift Grooves* is typical of many special Fitchburg machines into which independent Fitchburg heads can be built to cut costs through multiple automatic grinding on mass production. One grinding wheel rapidly traverses into the slot and then an automatic side wheel motion grinds one side of the slot, then the other. Meanwhile, the other grinding wheel comes in and finish-polishes the first side ground, then the second side which has just been ground. This is an automatic cycle from start to finish.

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FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U. S. A.
Manufacturers of—Bawgage Wheelhead Units, Multiple Precision Grinding Units, Gather Grinders, Cylindrical Grinders, Gear Grinders, Bank Fed Universal Grinders and Special Purpose Grinders

KEY WAYS
...the right way!





. . . . Internal shaping is another function of the Shaper requiring accurate performance. Here a Cincinnati Shaper holds close tolerances cutting Kennedy Key Ways in an eccentric.

Write for Catalog N-2



THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

THE *Springfield* PRECISION LATHE

Tool Room Lathes are equipped with lead screw reversing mechanism, producing right and left hand threads and feeds. Has automatic stops for both lead screw and feed rod. Oil pan is also included as regular equipment. Bed constructed of High Test Nickel Chrome Gray Iron.

Gear box is tongued, grooved and bolted to front of bed and is the enclosed type to exclude dirt and chips from gears. Wide gears and heavy shafts with ball and bronzed bearings used throughout.

36 changes of threads and feeds are obtained, and in connection with the reverse gears, either right or left hand threads can be produced without the use of wrenches.

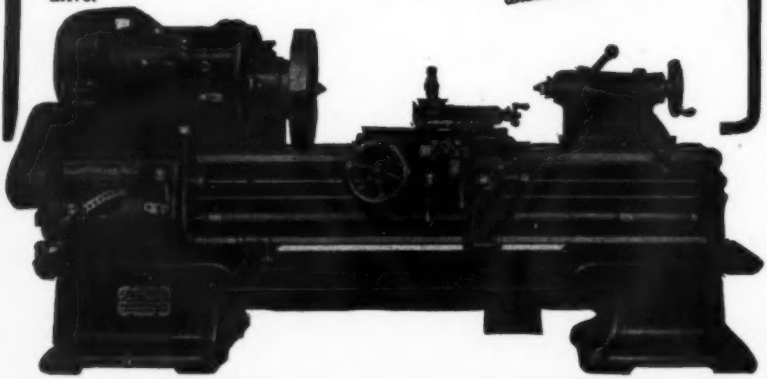
Massive tailstock, designed and constructed with long bearings on bed, is commensurate with the powerful headstock. All bearings and ways are oiled from one well.

Regular equipment includes large and small face plates, tool posts, steady rests and all necessary wrenches. Motors are located in large cabinet leg under head stock connected to machine by either V belts or silent chain drive.

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Tells the why and how of Springfield's accurate production.



THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO, U. S. A.



A DE LUXE SURFACE FINISH KIT for $39.50 COMPLETE

Surface finish control is rapidly becoming a "must" throughout the precision metal-working industries. If you are a designer, inspector, or operator you need this Sav-Way Surface Specimen Kit. It includes 16 actual metal specimens ranging from 2 to 600 micro-inches, including milled, turned, shaped, ground, lapped, and lapped-and-polished surfaces. The set is beautifully mounted in a deluxe leatherette case with easy reference index on inside cover.

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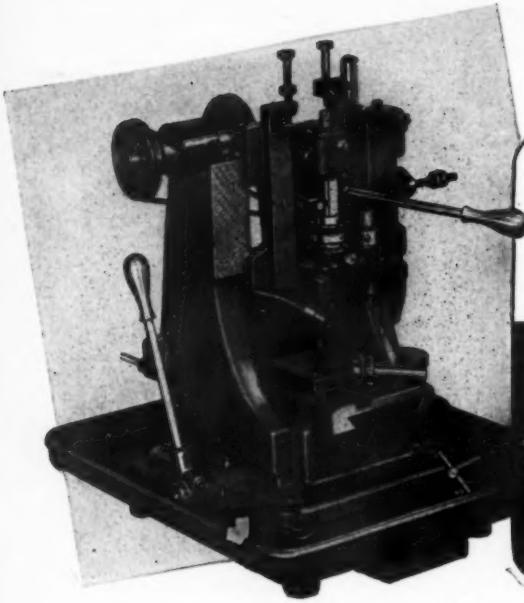
Comparing Internal Grind Finish



Lathe Turning



External Grind



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When you use the Wade Motor Driven Bench Profiler you save four ways. (1) You save time and (2) you save money. (3) You save work and (4) you save valuable space. You save time and money because this speedy, versatile little machine enables you to produce small precision parts quickly . . . and with greater accuracy. You save money because it increases the unit output per man hour and reduces spoilage to a minimum. Larger machines can be freed for jobs involving more work. And you save valuable space for this compact bench model measures only 19″ x 24″ x 22″ high. With the Wade Bench Profiler you can do profiling, milling, slotting, recessing and routing operations more efficiently and at a lower cost. This time-saving, money-saving machine will handle a wide variety of small parts. It is simply designed so that unskilled help can quickly become expert in its operation . . . so that new operators can immediately start producing accurate parts in money-saving time for you.

Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

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for Plastics, Wood, Hard Boards, Non-ferrous Metals, Alloys

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Makes Every Second Pay

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Infinitely Variable Speed • Speed Indicator • Chip Blower • 4-way Tilt Table • 2 H.P. Motor • Other exclusive features make DoALL safe and easy to operate efficiently.

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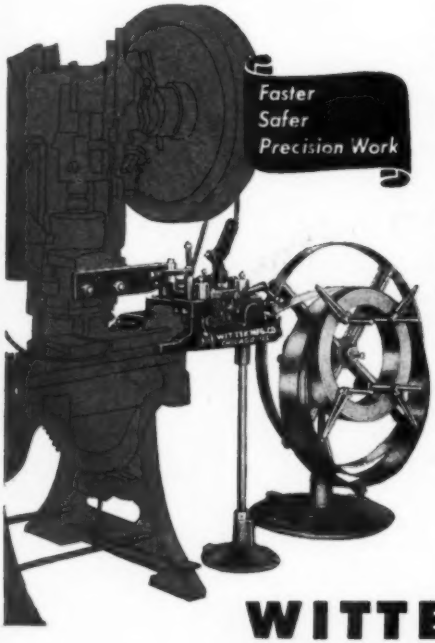
The DoALL Company — Minneapolis 4 Minnesota

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Automatic Roll Feeds and Reel Stands



Wittek Roll Feeds are being used extensively by war plants in their large volume production of high quality metal stampings. The flexibility of Wittek Roll Feeds will assist these plants in their peacetime conversion through their adaptability to various jobs. Keen competition will demand the utilization of equipment to its point of highest efficiency. If your postwar plans include punch press production of parts from coiled strip stock—investigate now the many possibilities of Wittek Roll Feeds and Reel Stands.

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ROLL FEEDS
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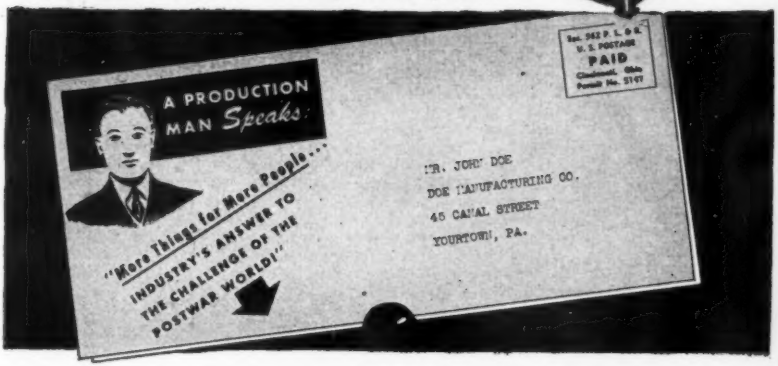
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BAND SAW
8 Speeds from 61 to 5300 S.F.M.





20" DRILL PRESS
5 Speeds from 260 to 5200 R.P.M.

- Using the correct cutting speed for every operation and material pays off in faster machining—fewer damaged tools and blades—cleaner, more accurate production. This all adds up to lower cost per piece!

Exceptionally wide speed ranges with ample adjustments between "high" and "low" enable Walker-Turner Machine Tools to cut costs substantially.

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MORE FOR YOUR MACHINE-DOLLAR
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RADIAL DRILL—$352.50 less base and motor.
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20" DRILL PRESS—$255.00 less motor. (Slightly higher west of Rockies and in Canada).

WALKER-TURNER COMPANY, INC.
PLAINFIELD, N. J.

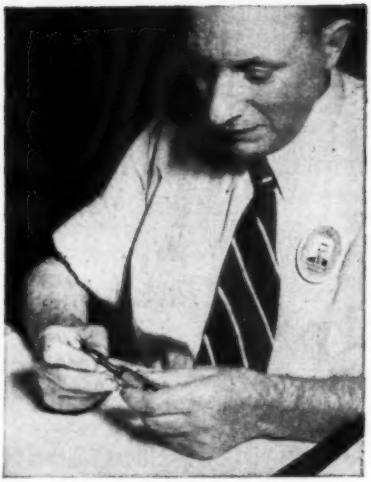
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MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS



POSITIVE GAGING WITH ELGIN SAPPHIRE GAGES *is speeding our peacetime production*



You don't have to "baby" an Elgin Sapphire Gage. This one has been used more than a year and a half . . . gaging more than a million close-tolerance piece parts.

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All too often, gage quality alone determines the difference between rejection or acceptance of satisfactory parts. That's why hundreds of manufacturers specify Elgin Sapphire Gages. The almost unbelievable dimensional fidelity of Elgin Gages is helping to improve and increase production, cut down costs and save waste. Get the facts!

Here are the answers to some questions you're sure to ask about Elgin Sapphire Gages:

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FOR ALL TYPES OF MACHINE TOOLS
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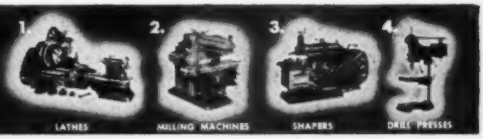


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ATLAS PRESS CO.

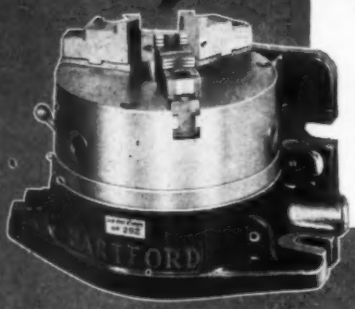
1150 N. PITCHER STREET, KALAMAZOO 13D, MICHIGAN

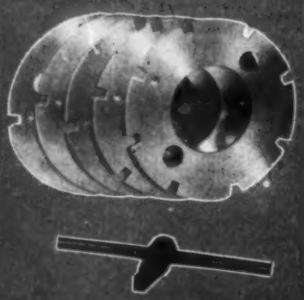
4 Atlas TOOL TEAM FOR SMALL-PARTS MACHINING



The HARTFORD Super Spacer

THE ULTIMATE IN CONTROL OF MACHINE OPERATION



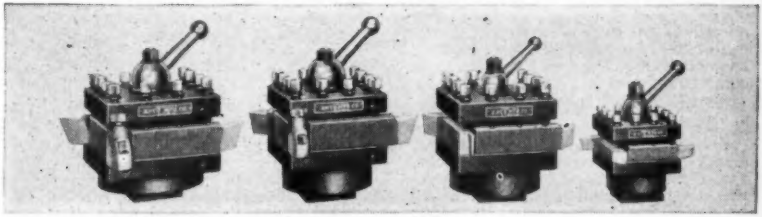


This versatile device is readily adaptable for milling, drilling, grinding, jib boring and slotting at feeds and speeds limited only by capacity of the holding means and power of the machine. It is a tried and proven tool of exceptional value in accurate indexing operations.

Descriptive circular sent on request

THE HARTFORD Special Machinery Co.
HARTFORD 5, CONN.

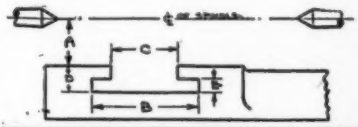
BIG ENOUGH to MOUNT a 2 inch HIGH TOOL —
or a No. 5 Tool holder for 5/8" bit



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Featured In This Issue

CARBIDE Milling of steel can be handled advantageously with standard machine tools if they are in good operating condition, altho special tools of course, permit speedier and greater output. Several typical jobs are discussed in the current contribution to the series of articles on Metal Cutting sponsored by Wesson Tool Co. and commencing on page.....141

•

TURNING STEEL with Negative Rakes is analyzed by Carroll Edgar, development engineer, Carboloy Co., Inc. Several drawings of tooling setups are included. See page.....155

•

MILLING PRACTICE has registered some important advances in increasing output and speeding production. C. W. Hinman presents some recent developments with pictures, in the story commencing on page 167

•

BELT DRIVE DESIGNS and some helpful suggestions are offered by John Hyler in the story commencing on page 183

•

THE FIRST BIG Post-war Metal Show will be held in Cleveland, Feb. 4-8. Read about it on page 190

•

LOOKING AHEAD is an interesting little yarn by George A. Benson which you will find on page.....192

•

SECTIONAL CARBIDE Nib Molds have been introduced recently by Firth-Sterling. You will find details and pictures in the section devoted to Production Trends commencing on page 199. In the same are some observations on Mechanizing the Foundries. Also a new project that has been advanced by Glenn L. Martin to "can" holdover war surplus tools and equipment.

•

BALLS are indispensable in many types of modern machinery. Section III of the series of articles on the versatility of these hard working useful little components includes many different applications. Perhaps you may find the answer to some problem bearing on the use of balls here. See page 217

•

MARKING DEVICES helped greatly in identification of the tremendous volume of war production items. They will be just as useful in post-war work. C. O. Malmstrom describes different types of manual marking devices in the story commencing on page 233

•

COSTS will have to be considered more carefully in post-war production and foremen can help greatly in achieving this result. Mr. Mottershead offers some pertinent comments in the story commencing on page..265

•

ELECTRONIC AIR CLEANERS and their uses are considered by Francis A. Westbrook in the story commencing on page 285

•

TYPES of Resistance Welding Work gives much pertinent information applying to this field. Different types of machines are shown and described. See page 301

•

"LET'S TALK SHOP" includes several helpful suggestions. One of these concerns induction brazing of tool tips. See page 330

•

A PARADE of new machines and new equipment makes up the new feature section commencing on page 342. Here you will find a new gear grinder, vibration test equipment, some new presses, a new tool grinder etc.

•

AN UNUSUAL Threading Job is described by Gerald E. Stedman in a story commencing on page.....412

•

MECHANICS Thru The Ages.....434

•

PRODUCT'S INDEX—listing the different types of products advertised in this issue, page.....440



BROWN & SHARPE CUTTERS



AS THE EDITOR SEES IT

AN interesting four point philosophy on behalf of high level employment was presented by Joseph L. Trecker president of the National Machine Tool Builder's Association at the recent fall meeting. The points he stressed were that:

1—We can increase employment in this country only in proportion to productivity.

2—Productivity can be increased only by the increasing utilization of machines which enable the worker to multiply his own output.

3—The pay which the worker gets should be related to his output rather than to the time clock.

4—Taxation policies should be revised so there will be an incentive instead of a penalty for the installation of equipment that will lead to greater productivity.

Expanding on the subject of the American principle of volume production in terms of jobs Mr. Trecker said:—"Insofar as a company by the aid of good machine tools and other productive equipment can cut the cost of its product, it can offer that product at a lower price. As the price goes down the potential market increases. As the market increases the volume goes up. As the volume goes up it becomes possible to hire more men. That is how more jobs are created."

As to compensation: — "Hourly rates are not a fair measure for compensation under our volume-production system. I don't think we ought to go back to the straight piecework system which was abused in past years by many manufacturers. But I say we should work out some method where, by mutual agreement, men's pay should be determined more by their output and less by their time-clock records."

"Until the workers of this country realize that jobs depend on productivity, we are not going to make proper headway in creating the number of jobs we must have to maintain the employment levels which we want in this country."

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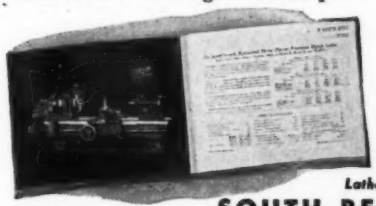


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The ART of METAL Cutting

PART XII—THE CARBIDE MILLING OF STEEL

(Technical Data, Courtesy Research Dept., Wesson Tool Co., Detroit)

CONVERSION to carbides for the milling of steel is frequently retarded by the mistaken notion that special and high powered milling equipment is necessary. This erroneous opinion has frequently blocked large possible savings in the machining of steel components.

A standard 3 hp, knee-type milling machine can, and has been used to effect economies that are possible with carbide. It may not be possible to increase chip loads and feed rates to a maximum when the horsepower available is represented by a standard No. 1 knee-type machine. It is unfortunate and very erroneous to compare the possibilities of carbide milling on a 3 hp machine with the possibilities on, for example, a 50 hp machine. The comparison rightly should be made between a high speed steel operation on a 3 hp machine and a carbide operation on the same piece of equipment. If this is done the economies that are possible will immediately reveal themselves as not only worthwhile but relatively large. A 4 to 5-

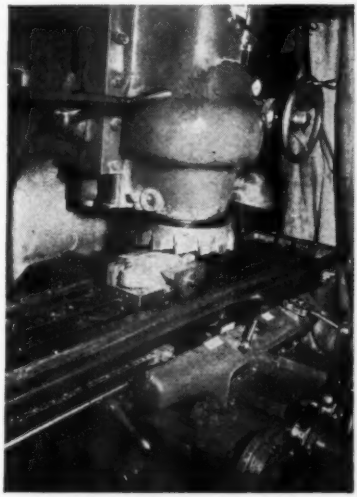


Fig. 2—Set up of operation on piece shown on Figure 1, showing relationship between cutter and workpiece.

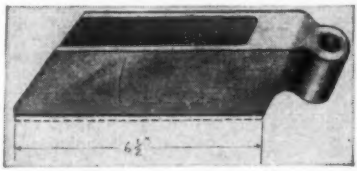


Fig. 1—Details of aircraft fuselage component.

time increase in the feed rate and therefore the production rate is possible on a small powered machine just as easily as on a larger, providing the basis for comparison is as previously indicated.

In the discussion that follows, a series of operations on small and medium sized milling equipment will be considered. An

operation indicated in Fig. 1 will present the first subject of discussion. This is an aircraft fuselage component, of SAE 4130 steel, and at this stage of its processing has been heat-treated to 230 Brinell. The width of the face of the workpiece is 3.615" and the depth of cut is 3/16" as indicated in Fig. 1.

The setup of this operation and the relationship between the cutter and the workpiece are clearly shown in Figs. 2 and 3. The 8" diameter cutter is of the solid steel body type with brazed tips. A surface foot rate of approximately 500 is selected for this operation; this is equivalent to a spindle speed of approximately 240 rpm. With a chip load of .010" and 10 teeth the feed rate is equal to 24" per minute.

The machine on which this operation is being performed is a standard 10 hp milling machine; the operation requires approximately 14 hp under the conditions of feed and speed just cited.

This then is a typical instance of a relatively small workpiece being milled on a medium sized standard machine at an increased rate of production of at least 5 times as compared with high speed steel. The overloading of a 10 hp motor to the extent of 40% is not objectionable since the operation is intermittent.



Fig. 3—Milling aircraft fuselage component shown in Fig. 1.

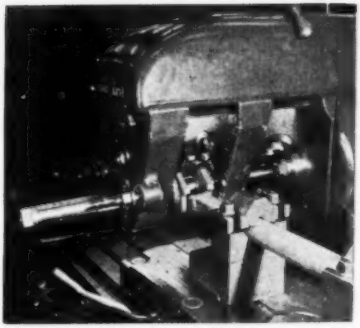


Fig. 4—Details of straddle milling operation which increases production materially.

In addition to the increased production, this steel component was milled with a resulting surface finish far superior to that possible with the older technique. Moreover, both the roughing and finishing operations could be performed in one pass with the carbide face mill. This was not possible with high speed steel.

While it is true that a larger machine if available, would have permitted increasing the chip load 50%, and with it the feed rate an equal amount, still the advantages of a carbide conversion for this operation on this medium sized equipment represents not only good practice in milling technique but sound economy. Such medium sized equipment as this is necessary to the completion of a production line and hence should be used for an operation as indicated.

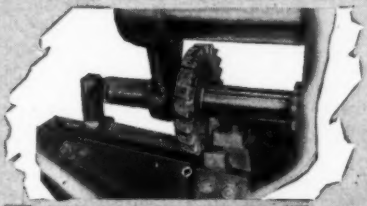
Finally it will be noted that this equipment is not only used to its full capacity but to a 40% increase, whereas with high speed steel less than one-fourth of the power available would have been utilized. Thus the entire investment is made to pay its way by full capacity production instead of a 25% productive capacity.

Figures 4 and 5 present an interesting straddle milling operation that increases production notably, betters the finish decidedly and makes possible milling in one pass to a much closer tolerance than was possible with the old method.

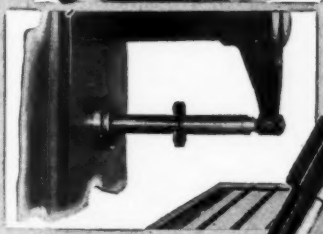
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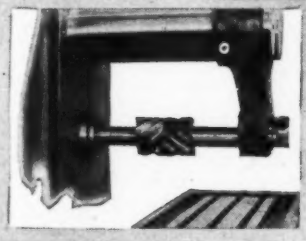
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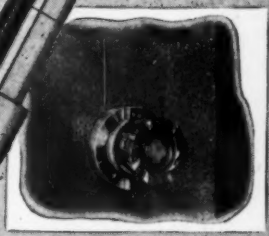


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In this operation the distance between cutters is 4.125" and the faces to be milled present approximately 3 square inches to each half side mill. These 6" diameter cutters are revolving 400 rpm which is equivalent to 630 surface feet per minute. Since this is an SAE 4130 material that Brinells at 190, this rate while somewhat high for good milling practice, will give satisfactory results as regards cutter life. These cutters call for a number of teeth equal to the diameter in inches plus 2; hence in this operation the 6" half side mills have 8 teeth.

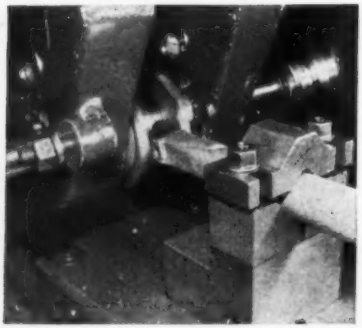


Fig. 5—Closeup of straddle milling operation also shown in Fig. 4.

With a chip load of .006", the feed rate in inches per minute will be .006" x 8 x 400 or 19.2". It is interesting to note that in spite of the fact that this set-up represents good practice, the chip load was further reduced to .005" in a subsequent set-up and thus the feed rate (IPM) was reduced to 16". Even so the increase over the high speed steel method was 8 times. The feed rate with high speed steel cutters was 2" per minute.

The set-up is worthy of passing comment. The use of arbor supports is excellent. The entire assembly is held as close to the column face as possible and arbor supports rigidly hold and support the arbor on either side of the cutters—and what is important, they are placed as near to the cutters as possible. Any unsupported arbor length at this point will cause vibration and distortion inversely at the rate of the cube of the unsupported distance. Thus if the unsupported portion of the arbor is reduced by half, the rigidity is increased 8 times. It is not practical to support the workpiece more rigidly than is shown. A more expensive fixture would make it possible to support the extended end of the workpiece by means of a spring plunger. However this is not justified because of the relatively few pieces to be milled in each lot.

Again it is noteworthy that this 7½ hp milling machine is adequate for this operation. In fact 8 hp is the loading when 1/8" of metal is removed from each side of this workpiece at the rate of 16" per minute. The high speed steel rate (table feed) was 2" per minute and the hp requirements approximately 3 hp. Thus production has been increased 8 times and the machine capacity is fully employed. The investment represented by this machine tool is paying dividends on the basis of full production capacity and not an eighth of it as was true when using high speed steel.

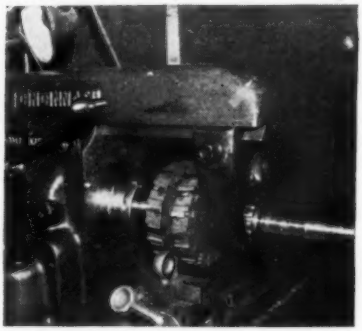
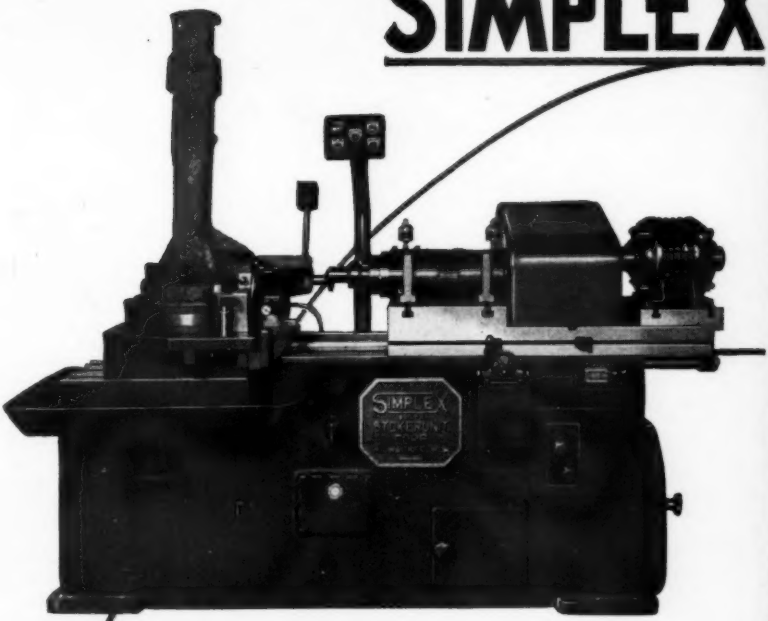


Fig. 6—Another interesting straddle milling operation.

Another interesting straddle milling operation is shown in Fig. 6 which will now be briefly considered from the standpoint of a suitable operation in steel milling for conversion from high speed steel to carbide.

The set-up of the job, including the fixture and the relationship of the cutters to the workpiece are all clearly presented

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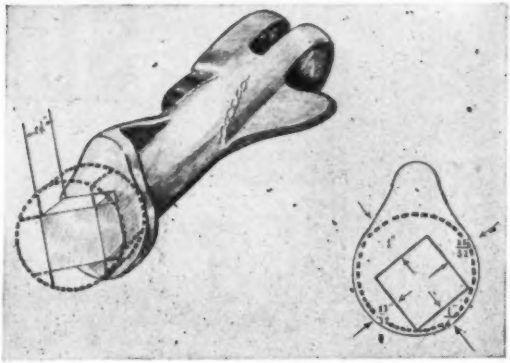


Fig. 7—Details of milling operation which involves milling of a square on end of a piece of SAE 3140 heat treated steel.

in Fig. 6. These "vital statistics" may be of interest in this production operation as performed on an aircraft fuselage component. The 12" cutters are equipped with 14 inserted blades having brazed Kennametal tips. The spindle speed selected for this operation is 150 which is equivalent to a surface foot rate of 465 feet per minute. A chip load of .006" was deemed adequate for this operation which results in a feed rate of 12-6/10" per minute. The table feed with high speed cutters was 1½" on this SAE 4130 material. The finish on this operation is excellent and the cutter life is approximately 3 times that using high speed steel.

The set-up is commendable except for the use of an arbor longer than is necessary. An extended arbor such as this presents a definite safety hazard. In other respects, however, this operation represents good milling practice. The table is close to the column face and the arbor support as close to the cutters as possible.

Figs. 7, 8 and 9 indicate plainly that such difficult operations as milling a square on the end of this SAE 3140 heat treated steel workpiece is possible with carbide. Indeed, it is not only practical but highly economical, representing an increase of 6 times in production and 4 times the increase in the number of pieces between grinds.

The finished and unfinished workpieces are shown in Fig. 8. Obviously the operation calls for the milling of a square, the dimensions of which are presented in the sketch Fig. 7. And in passing it is well to note the amount of metal to be removed by this operation. This also is clearly sketched in this same Figure.

Returning to the cutters (see Fig. 8) a

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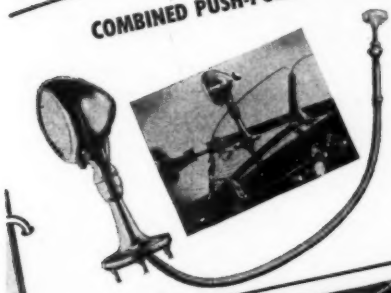
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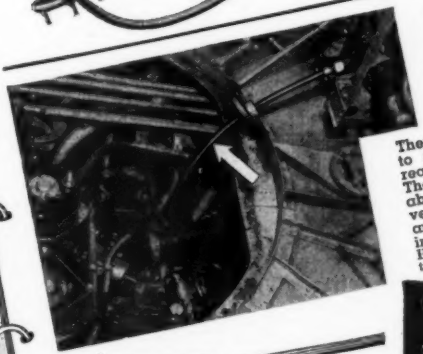
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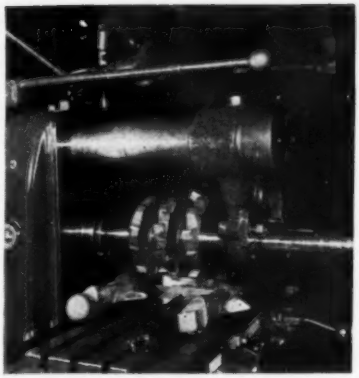


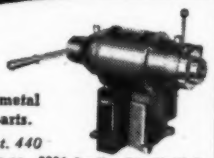
Fig. 8—Set-up for milling operation on Figure 7.

brief description indicates these specifications: The two end cutters are 10" diameter, 12 tooth, half side mills whereas the 2 middle cutters (see Fig. 9) are half side mills but set up in such way that they can be used on opposite sides in a manner to be described directly.

The fixture holding the workpiece is of the cradle type and is clearly shown in Fig. 9. It is so constructed that it can be revolved about its longitudinal axis 90°. Thus after two parallel sides of the square have been milled with the workpiece in position as shown in Fig. 9, the workpiece can be revolved thru 90° by means of this fixture bringing it into line with the two half-side mills on the right of the arbor viewed from the position of the observer. In each setting the table is fed vertically into the cutters so that the

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square on the end of the component (Fig. 7) is milled as shown.

These 10" diameter cutters, having 12 teeth, are revolved at a spindle speed of 200 rpm. The workpiece Brinells 190 and is therefore in the untreated stage. A chip load of .004" is chosen for this operation because of the lack of rigidity inherent in this operation, namely feeding the workpiece vertically as previously described. This calls for a table feed of 9.6" which represents more than a 5-time increase as compared with high speed steel cutters. Using the latter, a feed rate of 1½" was possible.

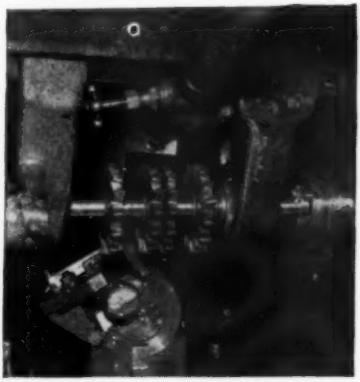


Fig. 9—Cradle type holding fixture for one of the operations on Figure 7.

Three results of this carbide conversion operation are noteworthy: (1) the increase in production, already mentioned; (2) the increase in surface finish which eliminates a subsequent grinding operation; (3) a significant increase in the number of pieces milled between grinds amounting on the average to 4 times. In addition reference might be made to the absence of coolant which characterizes all carbide operations on steel. While the saving represented by a "dry" operation is insignificant, the effect on other phases is noteworthy. Reference should be made particularly to the more attractive, cleaner and more sanitary working conditions which the absence of coolant makes possible. A converted carbide job even has beneficial effects on the human elements involved in its execution.

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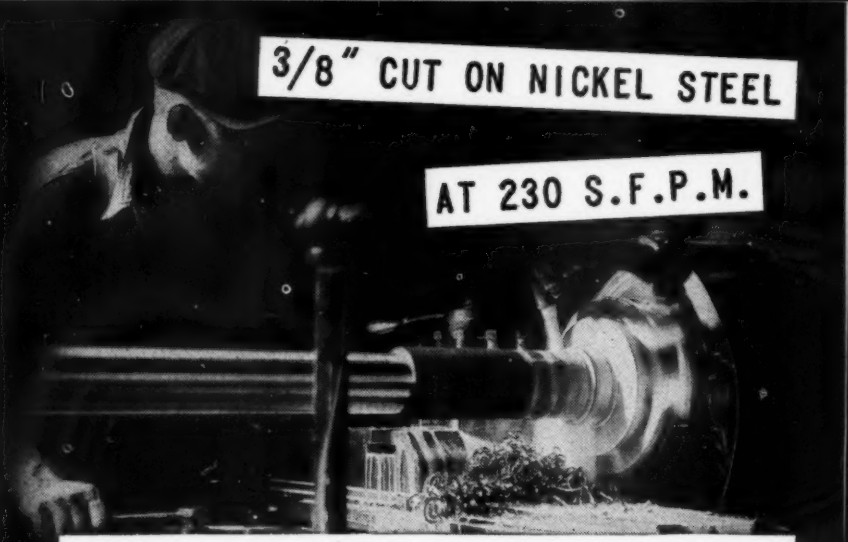
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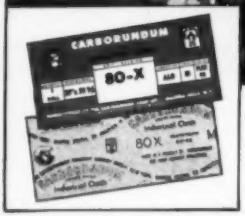
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TURNING STEEL With Negative Rakes

By CARROLL EDGAR*

THE success experienced with negative rakes on carbide milling cutters is arousing considerable interest today in the question of extending the advantages to broader fields of tool usage.

As a matter of fact, the turning of steels with carbide tools having negative rather than positive rakes is already being utilized in many shops. During the last phases of the war, virtually all manufacturers of artillery shells employed negative rakes for some turning cuts.

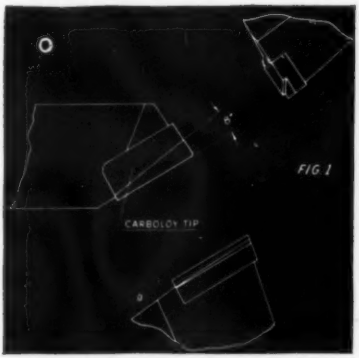


Fig. 1—Sketch of typical carbide turning tool showing double negative rakes—5° negative back rake and 5° negative side rake.

Frequently, negative rake turning of steels has been found materially to prolong life between grinds by protecting the cutting edge against chipping. This is especially true where work is eccentric; on interrupted cuts, and where an appreciable amount of scale is present.

On a carbide tool, negative **back** rake protects the tool's cutting edge because any irregularities on the surface of the work piece—scale, lugs, etc.—will strike the tool in back of rather than on the

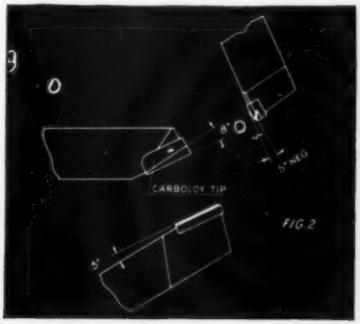


Fig. 2—Detailed "close-up sketch of the chip breaker section on the tool illustrated in Fig. 1 to show the negative rakes.

nose, the "weakest" part of a carbide tool. A negative **side** rake tends to throw the chip back away from the cutting edge, warding off chipping of the carbide blank in a **longitudinal** direction. Carbide tools with negative rakes have been found to chip less readily than positive rake tools when machining work such as forged shells which are usually covered with a heavy crust of scale and are frequently so eccentric that depth of cut varies from ⅛" to ¾" per revolution.

Benefits from negative rake carbide tools are illustrated by a Michigan plant which turned out 5000—155 mm

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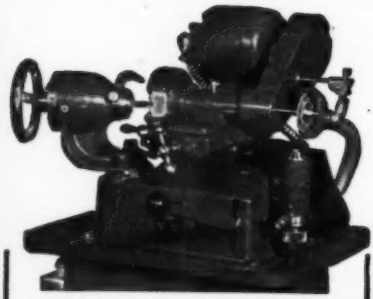
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shells per day over a period of many months An average of 250 shells per grind was obtained with conventional carbide tools. When negative rakes were used, pieces per grind rose to an average of 400. Similar increases have been reported by other users of negative rake carbide turning tools. Generally, where negative rake carbide tools have been introduced for scaly or eccentric steel pieces, their use has tended to become standard for rough machining of forgings and castings.

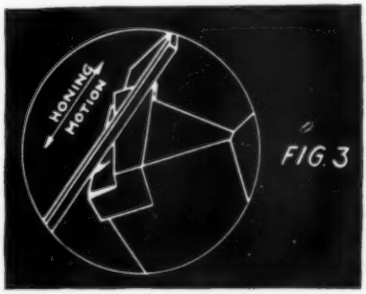


Fig. 3—Sketch to show method of honing cutting edge of a negative rake turning tool at a 45° angle.

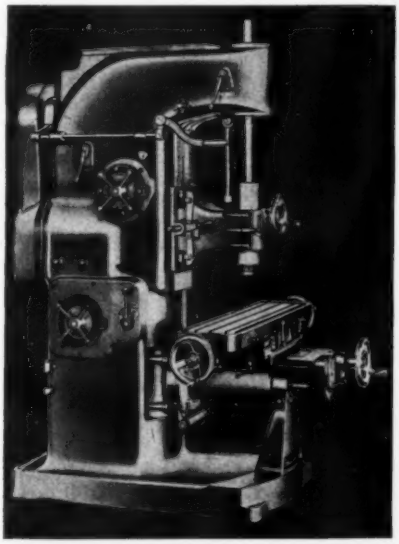
TOOL DESIGN

For rough turning of steel forgings, a carbide tool having a negative back rake of 5° and a negative side rake of 5° is a generally satisfactory design (Fig. 1). These angles are usually confined to the **chip breaker** rather than the entire blank (Fig. 2).

Negative rake carbide tools for rough turning give even longer operation between grinds if cutting edges and nose radii are honed at a 45° angle (Fig. 3). Width of chamfers thus formed should be from .005" to .010" for optimum results (Fig. 4). Honing removes any "ragged" edges the cutting edges may retain from re-grinding. Honing also helps prolong the time between sharpenings by protecting the cutting edge somewhat against the "sawing" action of scale if it is present on steel. It is impossible to eliminate the effect of this

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"sawing" action entirely, even with carbides, since steel scale is abrasive to the point of producing a true grinding action.

Nose radius proportions on a negative rake carbide turning tool generally should be the same as on positive rake tools. If the nose radius is too large, the tool will develop a tendency to chatter; if too small, the tool will break down. Relief angles on negative rake turning tools are also the same as for conventional tools—i.e., from 5° to 7° side and front relief angles.

SET-UP, MACHINE CONSIDERATIONS, ETC.

In general, the nose of a negative rake tool should be set on or slightly above center line of the work piece. Where possible, use a side cutting edge angle of 10° to 30°. This eases the tool into the cut and out of the work at the end of the cut, whereas a tool with a zero side cutting edge angle tends to jump out of the cut, a condition which can easily lead to tool breakage. Moreover, chip load per unit of length is less with such an angle than on a tool with a zero side cutting edge angle.

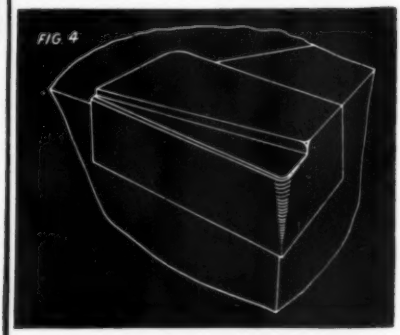
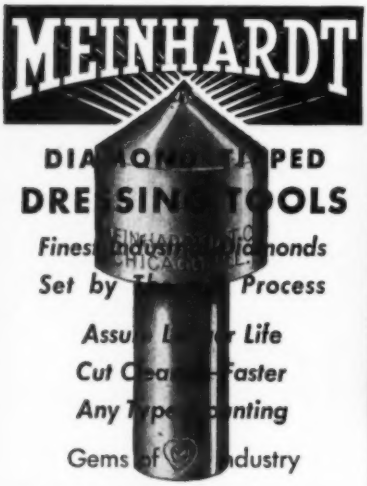


Fig. 4—Detailed "close-up" sketch of the honed edge of the tool shown in Fig. 3 to illustrate proper width of chamfer.

Optimum speeds and feeds for negative rake steel turning are usually the same as when positive rake tools are used.





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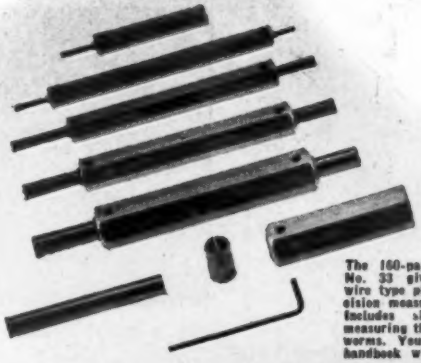
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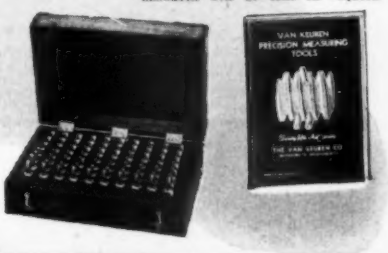
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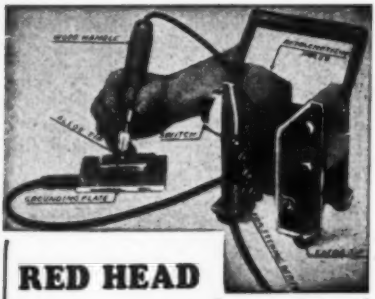
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If coolant is used on a negative rake turning job, a copious flow should be directed from the **bottom** or from **one side** of the tool so the chip will not keep the coolant away from the tool's nose. Negative rake turning of steel tends to generate more heat in the chip than does conventional turning. Some of this heat flows into the tool, as a result of which a coolant is more often needed than when machining with positive rakes.

Negative rake turning of steel also requires 10% to 15% more power than does conventional turning. Usually, no power difficulty will be experienced with any machine tool suitable for using carbide tools.

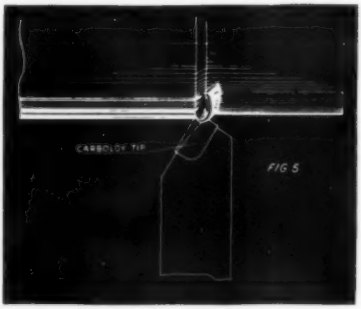
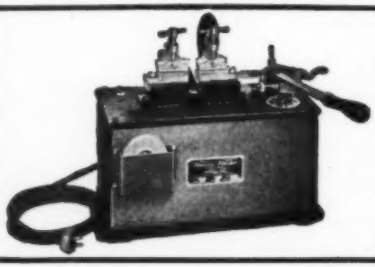


Fig. 5—Sketch showing a typical negative rake carbide tool used for taking finishing cuts on steel.

FINISH TURNING

Altho at present, negative rakes are most frequently used for rough turning



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steel — especially forgings having a heavy crust of scale—there are some instances where negative rakes have been profitably employed for the finish turning of steel, especially on interrupted cuts. For this work, however, the edge of the tool is usually honed to a chamfer width of .003"-.005" a little beyond the depth of cut to be taken. This type of tool (Fig. 5) will give somewhat increased tool life where heavy chips are not formed inasmuch as the negative rakes apparently protect the cutting edges against concentrated shock loads caused by hard spots in thin steel chips which—altho invisible to the unaided eye—have been known to wreck the edges of cutting tools.

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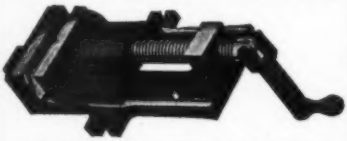
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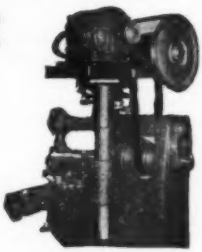
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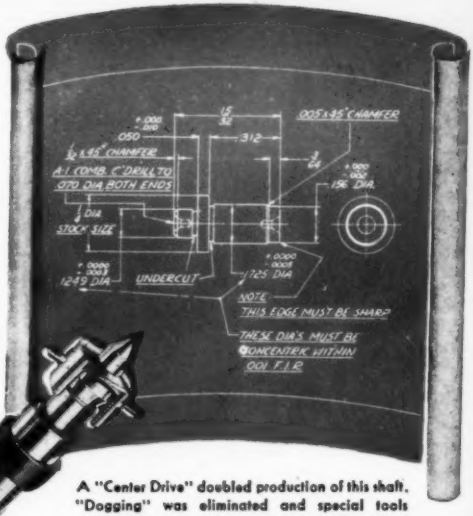
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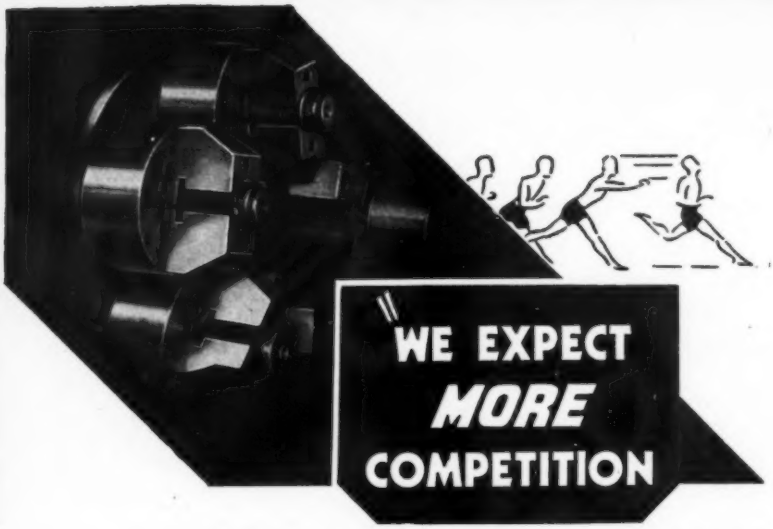
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in post-war years, and will have to do our work cheaper, better, and in greater quantity", says a prominent production executive. Right! Post-war competition will be more aggressive than ever before known in this country of free competition.

Victory in this coming battle of production will go to those who have the foresight to plan — now — operating policies and mechanical equipment for the greater machine efficiency and increased output per man-hour that will be demanded.

LET US HELP YOU PLAN YOUR RETOOLING

Though civilian production will involve holding work of shapes far different from those now being handled, construction of special work-holding devices can be avoided in many ways; for example, by use of two-piece jaws with soft blank top-jaws machined to the required form.

This is but one of many seemingly small details that can be combined to save set-up time, reduce tooling cost and cut machining costs . . . thus materially strengthening your post-war position.

Our engineering department is genuinely anxious to assist forward looking production men in solving new work-holding problems.

THE CUSHMAN CHUCK CO.
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CUSHMAN CHUCKS

KICK PRESS

Develops "9-to-1 Punch" Powered by NOPAK AIR CYLINDER



When this efficient kick press was operated by foot power, it was possible to punch only 1 or 2 holes at a time in 20 gauge sheet steel. Punching dies of limited capacity had to be used. NOW . . . with a Model E NOPAK Air Cylinder in place of foot power . . . it is possible to use gang dies of 9-hole capacity, or more.

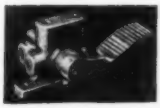
A NOPAK Foot Control Valve actuates the cylinder, leaves operator's hands free to feed sheets into the die, reduces manual effort and fatigue to a minimum.

With capacity multiplied many times, the unit cost of this and similar punching operations has been cut substantially. The cost of conversion to air power has been paid for many times over. If you have machines that could develop "new punch" with NOPAK Valves and Cylinders, write for further information.

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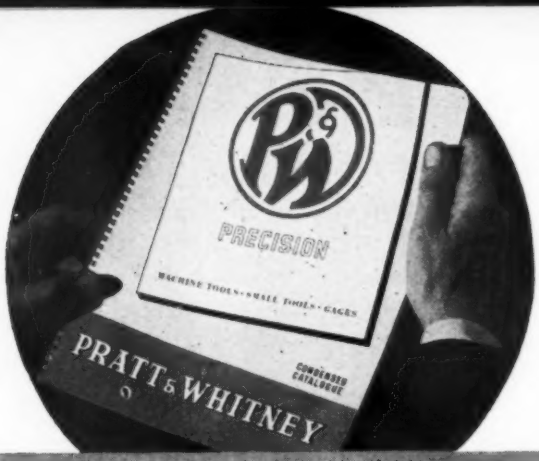
A Model E NOPAK Cylinder (pendulum mounting) of 3" diameter and 7" stroke was used to power this kick press. A Model R Foot Valve controls it.



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DESIGNED for AIR and HYDRAULIC SERVICE



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Recent Progress In Milling Machine Operations

Part III — Some Typical Jobs

By C. W. HINMAN, Designing Engineer

ECONOMICAL milling depends upon driving the cutters at their highest speeds without dulling them prematurely, and using the greatest feed the cutters will take without too many stops for regrinding. The speed also depends upon the grade of work finish required. These conditions are governed by such stipulations as: nature of the work material, length and depth of cut, size and type of milling machine, and the efficiency of the fixture for holding the work rigidly. These conditions are so varied that it is advisable to determine the speeds and feeds by trial for each new mass-production job. A record should be made of the best run, including the machine and the cutters used, and this record consulted when the same job is scheduled for the next order.

Special Equipment

This means that special fixtures are employed for holding the work, or that

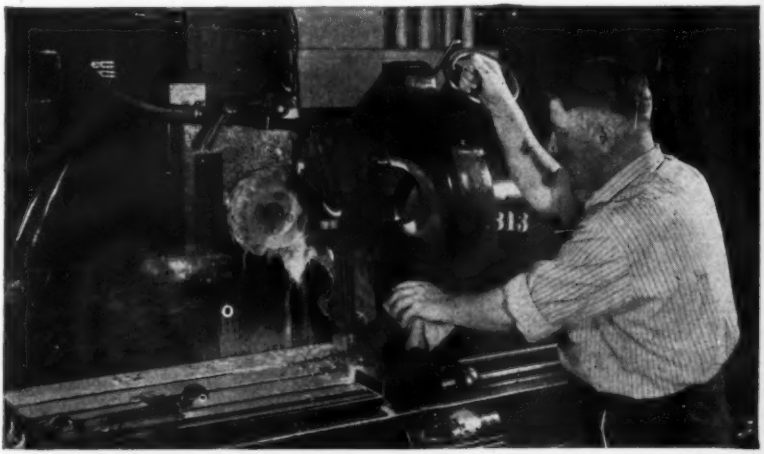
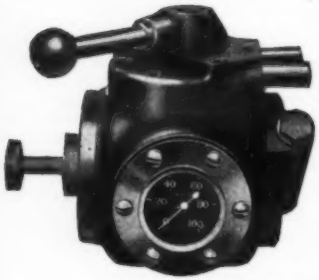


Fig. 11—Rough milling crankcase cylinder pad bases for the Cyclone aircraft engine at South Bend, Ind. The machine used is a Cincinnati hydraulically controlled miller. (Courtesy—Studebaker Corp.)

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AIR CONTROL UNIT



This convenient unit is adaptable for all air operated machines wherever air control is required. Pressure regulator, gauge, control valve, lubricator and strainer are combined in one efficient, time-saving mechanism.

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EQUIPMENT, INC.

special cutters, a special attachment or a complete special machine is used. The machine may be built with several unusual features; the position of the arbor and cutter head may be a radical departure in design from that of a standard machine, in order to mill unusual shapes of work.

All milling fixtures are special, but they can be used for holding work in either a standard or special machine. Special milling machines and fixtures must produce a large output to offset the extra cost of building them. New tooling requirements should direct our attention first toward designing fixtures, attachments, and cutters for a standard machine, which is the usual procedure.

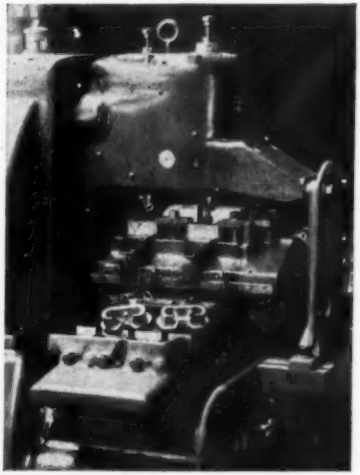


Fig. 12—This combination of a 2-spindle vertical cutter head and a double clamping fixture with automatic cam controls for moving the work under the cutters, obtained a high production rate on end milling these links. (Courtesy Kearney & Trecker)

Preventing Cutter Breakage

To avoid breaking frail milling cutters when they encounter heavy strains, use a shear key for driving one of the gears in the machine. Shear keys are made of soft brass; their strength is

SHAPING · Milling · Drilling · Boring

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TURRET MILLING MACHINE . . . .

A new shaping attachment adds greatly to the utility of Bridgeport machines. The design is such that this new attachment (shown on back end of overarm) can be mounted on existing Bridgeport turret Milling Machines and also on other types of milling machines and special production equipment.

Shaping operations can be performed at all angles, making this attachment fast and practical on die and mold work of all kinds, as well as for intricate slotting on production jobs.

The Bridgeport Turret Milling Machine with High Speed Attachment handles milling, drilling and boring at all angles, with maximum ease and convenience. It is accurate and speedy, sturdy and powerful—a precision machine for production demands.

Features include: — 15" diameter turret with 5" overarm, rugged construction, table, knee and saddle in convenient front-of-machine position, anti-friction bearings throughout, keyed overarm with worm wheel control for angular settings, large diameter graduated dials.

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THE BRIDGEPORT MACHINES, INC., *Bridgeport, Conn.*

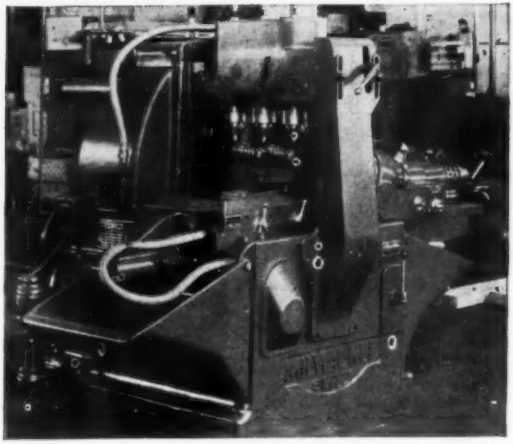


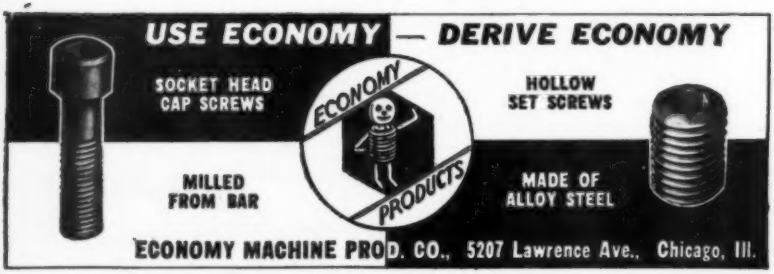
Fig. 13—This is a special 3-spindle cutter head and an automatic indexing fixture designed to permit the production milling of teeth in rotary bits for drilling oil wells. Teeth in three bits are milled in one setup. (Courtesy Kearney & Trecker)

determined by experiment. At General Electric's Erie Works, the shear key is made extra long and extends out against a depressed disk, which controls a limit switch. When an extra-heavy load occurs on the cutter, the key shears off and releases the disk, causing the switch to operate and stop the feed of the machine.

Electric Control

A good example of electrically controlled milling machines is a thread miller. An electric control feeds the cutter into the work at a preselected speed, then it automatically switches to another speed for feed around to cut the thread. It then rapidly reverses the feed motor when the cut is finished, and finally stops the motor. Because the feeding and cutting cycles do not vary, electric control improves the quality and finish on the work and increases the life of the cutter.

Another application is for milling the many beveling operations on spar beams. The carriage speed is varied automatically so that its movement is inversely proportional to the cut. The result is that finishing time for some of the spar beams has been reduced from several hours to only a few minutes. A complete report of these and many other applications of electronics in machine work will be found in a



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● Hansen couplings have won their international popularity on their performance, a performance that spells economy on every job.

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bulletin called "Industrial Electronics" published by General Electric Co., Schenectady 5, N. Y.

The five accompanying photographs show recent applications of electrical and hydraulically controlled feeds for milling. These operations are performed by using especially designed fixtures and attachments on standard milling machines.

ROUGH MILLING

Cyclone Engine Crankcases

The operation shown in Fig. 11 is rough milling crankcase cylinder pad bases for Cyclone aircraft engines. Two of the milled pads are shown directly above the operator's left hand. The one above these two has not been in contact with the cutter. A cast-iron work holding fixture bolted on the milling machine table is indexed from pad to pad by the operator. The milling machine table is fed and reversed by hydraulic action.

The crankcase of an aircraft engine is in effect, the frame around which the engine is built. Upon it the cylinders are mounted, and within it the crankshaft, master rod and articulating rods are housed. The crankcase for a Cyclone engine is machined from two steel forgings which together weigh roughly 356 lbs. when they enter the plant. By the time these forgings reach the final assembly line as finished crankcases the weight is approximately 79 lb., and they have gone thru a total of 150 machining operations.

End Milling with a Special Attachment

The tooling setup shown in Fig. 12 employs a special cutter head attached in a Milwaukee standard milling machine. Two vertical end mills are driven from the main spindle by gears mounted inside the attachment housing. The work is end milled in its elongated cavity by a cam controlled fixture shown mounted on the milling machine table. Two of these links are milled in one setup, and finished samples are shown lying on the table.

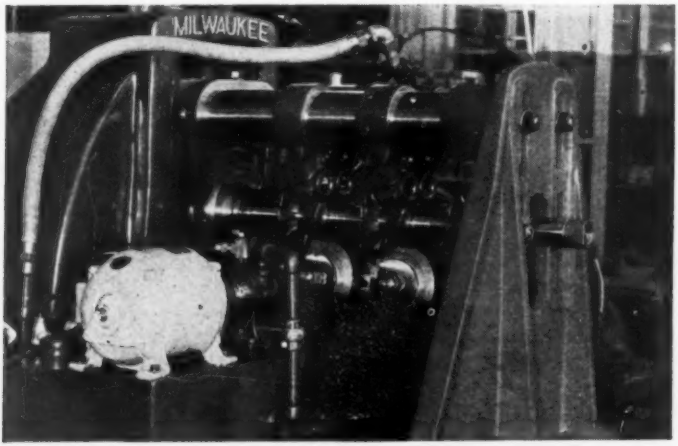
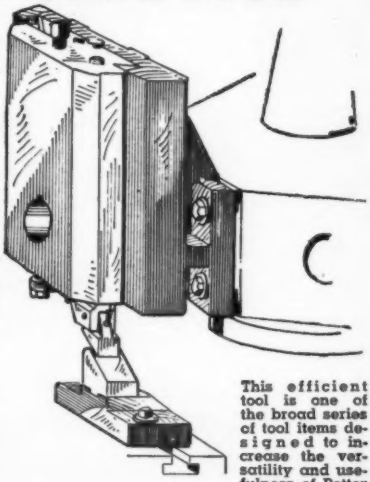


Fig. 14—Represented in this rigid setup is an electrically indexed automatically operated 3-spindle master fixture used in the manufacture of oil well drilling equipment. The work being milled is rock drill bits. (Courtesy Kearney & Trecker)

STANDARD VERTICAL SLIDE TOOL



This vertical slide tool is designed for the special purpose of cutting a recess in an internal diameter at any predetermined location. The shaped cutter is carried by a bar held in the hole of the slide. When the cutter reaches the proper location, at end of turret movement, the slide is raised by a cam block carried on the cross slide of the machine and makes the cut while the turret feed dwells at that point. When the cut has been made to desired depth, the cam block releases slide and cutter drops down to its original position.

This efficient tool is one of the broad series of tool items designed to increase the versatility and usefulness of Potter & Johnston automatic turret lathes.

This tool is also used for taper boring, taper turning or crown turning, such as on pulleys, etc. When used on work of this kind, the tool slide is actuated by means of a former plate or cam fastened to cross slide base or to bracket on overhead pilot bar.

This tool is carefully designed and constructed for its special purpose, with rugged proportions adapted for accurate cuts.

Detailed dimensions and specifications are included in this helpful new catalog. If you use Potter & Johnston machines, many of the new tools illustrated and described will help you to reduce costs and speed production. May we send you a copy today — no obligation?



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Clipper Hooks are made of the finest quality wire—BETTER than ever before—produced for our exclusive use. Hooks hold with firm, sure grip — give longer satisfactory service.

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The Clipper No. 9 Portable Lacer laces belts up to 6 inches wide in one quick, easy operation. Under powerful pressure hook legs are embedded flush with the surface of the belt and points clinched, making a perfect joint. Phone your mill supply jobber for a demonstration!

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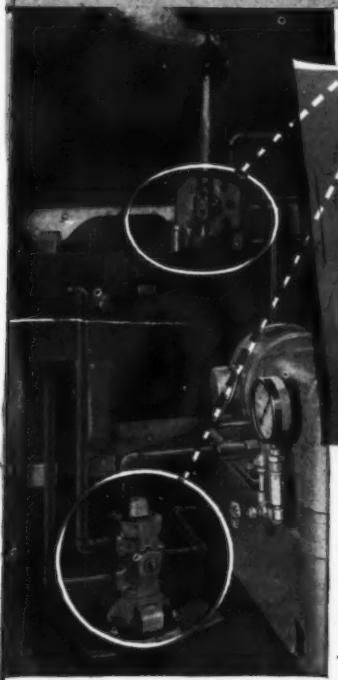
Building of special equipment, such as the cutter head shown, must be guided by considerations of economy, accuracy, utility, and productive capacity. Special tooling can be either profitable or wasteful. Ordinarily, there are two considerations that enter into the problem of designing special attachments:—(1) Building a special machine if the output requirement is large enough to justify the cost. (2) Building a special fixture and/or an attachment, as was done in the case shown in Fig. 12.

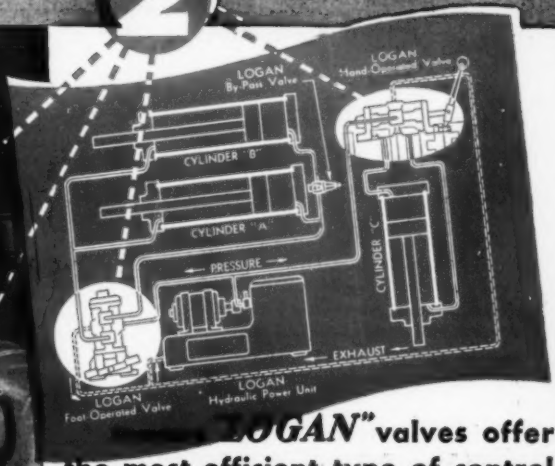
Concerning these alternatives, it is best to avoid building special machines unless the conditions warrant it, and instead concentrate upon producing the work with low-cost fixtures and attachments that will give optimum performance on standard milling machines. To analyze this policy means: (1) That the initial cost of a special attachment, as compared with a special machine, is considerably less than the cost of the machine. (2) That the greater part of the investment still remains in the machine. (3) That whereas a standard machine immediately can be put to other productive uses when a job requiring special equipment has been completed, and that a special machine may stand idle much of the time. (4) That where changes in the part design may require a revision of the manufacturing process, the loss of a low priced fixture is far better than losing the entire cost of a high priced special machine.

Gashing the Teeth in Conic-shaped Cutters

Large quantities of conic shaped rotary bits, having spirally stepped diameters, are used in oil fields for boring wells. Fig. 13 illustrates the method for setting up three of the cutter blanks on the arbors of a fixture for gashing teeth in each of the five stepped diameters. The cutter blanks are turned on a lathe from a solid piece of special alloy steel. The milling machine head is of a special design. It operates three vertically arranged cutter heads, all in a straight line, and short arbors for holding the work that correspond with the positions of the heads. The cut-

6 HYDRAULIC MOVEMENTS CONTROLLED BY 2 STANDARD VALVES

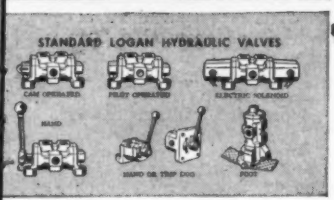




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Two double-acting hydraulic cylinders operating in sequence are controlled by a single Logan foot-operated hydraulic valve in this application. Pressing one treadle directs oil to the blind end of both cylinders; a Logan by-pass valve regulates Cylinder "A" to its outstroke, after which Cylinder "B" starts operation. Pressing the other treadle directs full line pressure to the rod end of both cylinders. The hand-operated Logan hydraulic valve controls a third double-acting cylinder (Cylinder "C") used for a pressing operation.

Standard Logan hydraulic valves permit manual or foot, remote, semi-automatic, automatic, time delayed, interlocking and sequence control of single and double-acting cylinders. Hand-operated valves are available for *oil service* in plain, latching, spring return and open center types; for *water service* in plain and spring return types. Other 4-way control valves include foot, electric solenoid, cam-operated and pilot-operated models. The pilot-operated valves are furnished for either air or hydraulic operating valves. A complete line of relief, reducing, by-pass and speed control valves is also available.



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Refer your hydraulic circuit problems to Logan engineers for careful analysis and recommendations. Layouts furnished. No obligation for this service.



FREE LITERATURE

Get your copy of Catalog 80, Section 3 on Logan hydraulic control valves. Also ask for literature on Logan cylinders and hydraulic power units.

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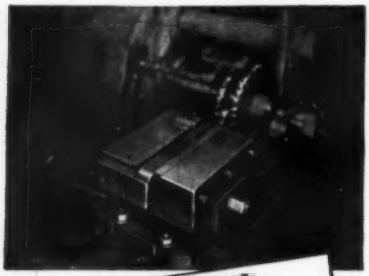
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SPECIFICATIONS:
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Overall Width 6¾" Depth of Jaws 1¼"
Overall Length 7½" Max. opening 2"
Net weight complete with 4 hold down bolts ⅜" diameter, approximately 36 lbs. Price: F.O.B. Factory, $65.00.

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DIAMOND DTCo
Manufacturers of the DIAMOND Line of Precision Milling Machines and Accessories

ters used are two-lipped standard end mills.

Referring to the picture, each of the three arbors is inclined up to an angle corresponding to the angle on one side of the work. Thus, the tapered side of the work is positioned in a straight line with the ends of the milling cutters. This makes it possible to gash all the teeth on each of the five steps and in three bits, at one indexed position.

The small end of each cutter bit begins with a spiral lead that gradually increases in depth thruout the length of the cone. In other words, these cutter bits are composed of an increasing spiral lead thread which is gashed to expose the teeth. By adjusting the horizontal position of the arbors toward the right or left, rake teeth or negative rake teeth can be gashed. This operation is not precision work, and accurate positioning and cutting are unimportant.

The bits fit over an arbor key that enters a keyway in the center holes. The work is clamped by a knurled nut at the outer end of each arbor. Indexing between tooth spaces is accomplished by the action of a train of gears within the housing of the fixture. A locking device secures the arbors after indexing. Shallow cuts are taken at the left arbor, deeper cuts at the center arbor, and finishing cuts at the right arbor. The table feed is controlled by a hydraulic cylinder under it. The enclosed housing in the foreground contains the automatic feeding and indexing mechanisms. Two adjustable "trip dogs" that reverse the feed are seen in front of the housing. A spout delivers coolant on each cutter from an oil pump, and a pan for carrying away chips and oil is provided beneath the arbors.

Milling Teeth in Rock-drill Bits

Fig. 14 shows a special milling fixture mounted on the table of a standard milling machine. The fixture has three horizontal arbors connected in a rear





A Starrett "Hi-Ite" on the job at Consolidated Vultee Aircraft Corporation's Fort Worth Plant.



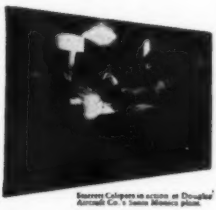
Checking the angle on a connection form die with a Starrett Bevel Protractor at Curtiss-Wright, Buffalo.



A Starrett Vernier Height Gage at Fairchild Aircraft Division of Fairchild Engine and Airplane Corp., Hagerstown, Md.



At an American Airlines shop a propeller is being checked by a Starrett Micrometer.



Starrett Calipers in action at Douglas' Aircraft Co.'s Santa Monica plant.



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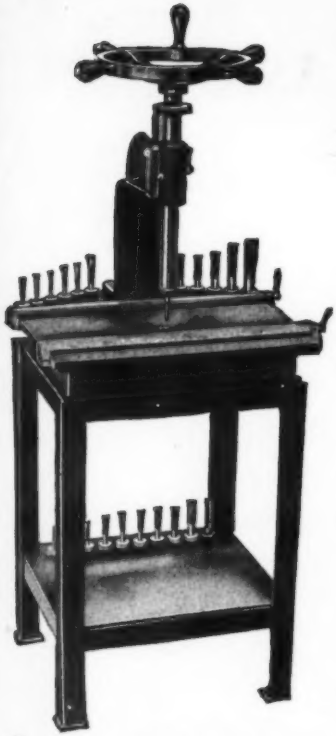
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housing by gears that index all the arbors in unison. One cutter bit blank is placed over a key on each arbor and then clamped with a nut in front of a C-clamp. The arbors are indexed and fed for cutting the teeth by an electric motor, and are locked in positive positions by a pawl that engages in the edge of a notched disk.

Three high-speed steel formed milling cutters are spaced with collars on the cutter arbor, the latter being driven by the main spindle of the machine. The outer end of the arbor is supported by an outboard bearing bracket bolted to the machine frame, and its upper end is attached on the two overarms that project from the column of the machine.

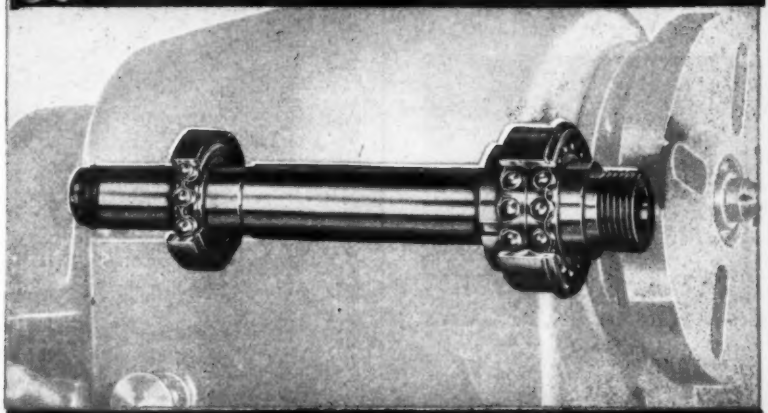
The cutter bits are a special alloy steel and are subsequently hardened. An electrically driven pump in the foreground circulates a coolant on the cutters. The pump and motor are mounted on the tank that strains and holds the coolant. These cutter bits each have 16 teeth, and the hourly output is about 12 bits per hour. The bits are used for drilling rock formations in sinking oil wells.

Cutting 576 Slots in 12 Transmission Hubs

The setup shown in Fig. 15 is a good example of designing a special attachment for use on a standard milling machine. Two cutter arbors with three slitting saws mounted on each, are driven by the main spindle of the machine. These cutters are adjustable as to their vertical positions, as shown by the outboard bearings attached in a vertical slot at the left foreground. The arbors and cutters are arranged to cut above and below the work simultaneously.

Three workholding arbors, each carrying four pieces of work, are loaded and unloaded by backing away the housing in which they are attached. These arbors are indexed from slot to slot in unison by gear connections in the housing, and each arbor is located

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No. 825 Cabinet Model Quick Change Gear Lathe

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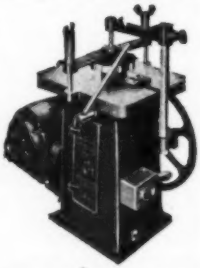
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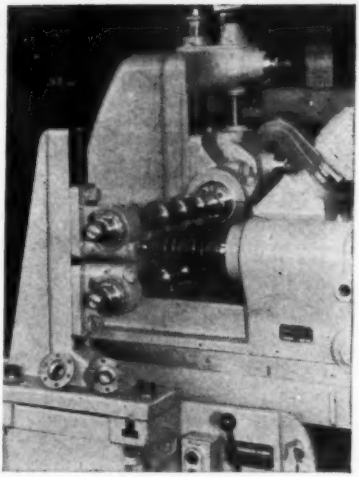


Fig. 15—Speed and accuracy in production were the outstanding contributions in this special setup. Twelve transmission hubs are mounted on workholding arbors and 58 saw-slots are milled in each hub. (Courtesy Kearney & Trecker)

positively, before the cut, by a pawl that engages in a notched disk. Indexing and feeding the three arbors is under the control of an electric motor operated by limit switches. A total of 48 slots are cut in the periphery of each piece of work. Samples of the work, before and after the operation, are lying on the machine. Notice that the work pieces interlock, that is, they are alternated on the arbors so that they may be placed as closely together as possible. This feature gives a more compact design for the fixture and when milling, diminishes the idle spaces between the work pieces.

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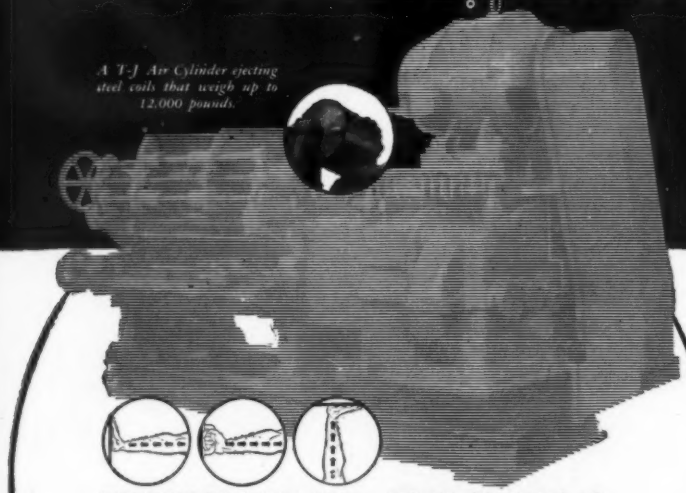
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BELT DRIVE DESIGNS

By JOHN E. HYLER

THE average belt user is not usually called upon to go into the finer points of belt drive design, but it is wise for him to be acquainted with the salient factors which affect the performance of transmission belting, in order to exercise good judgment. It is necessary that a belt be sufficiently strong to do the job it is called upon to do. It is needful that it have surface adaptability or frictional properties in a sufficient degree that it will not slip on the pulleys. It must have sufficient flexibility to negotiate the smallest pulley of the drive without doing damage to the belt itself because of too severe flexing. These considerations are fundamental, and if any of them are neglected, you cannot have a really successful drive.

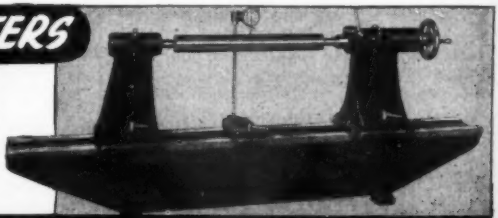
With reference to the strength of belting, there is seldom any trouble experienced with breakage, except in cases where belts have been run at exceedingly high speeds. So long as speeds are relatively low, there is a distinct mechanical advantage in having pulleys of relatively large size on a given drive, for the larger-sized pulley gives a longer and more powerful leverage to the belt pulling against the load on the one hand, and provides a greater area of contact on the pulley also.

But when speeds begin to increase above a certain point, this advantage begins to disappear, for centrifugal force adds up greatly with higher belt velocity, increases the strain on the belt, and tends to throw the belt out of contact with the pulleys. Tables have been computed and are undoubtedly available from power transmission specialists, which show the centrifugal force factor for different weights of belts operating at different velocities. As an instance, a 4" belt weighing one pound per foot of length, will have an added tensional strain upon it caused by centrifugal force of only 0.08 lbs., when running at a velocity of 100 feet per minute. The same belt running at 1,000 feet per minute will have an added strain of 8.6 pounds. The same belt, running at 2,000, will have an added strain of over 34 pounds, and if you run it 6,000 feet per minute, it will have an added strain upon it of well over 300 pounds.

With facts like these before us, it should be no mystery when a heavy, high speed belt breaks on the run, and we should be able to appreciate that there is an ideal pulley size for any given drive, that will allow us to take advantage of greater belt contact and extra leverage, without running into ex-

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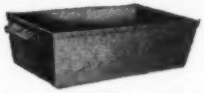
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cessive belt velocity. The exact ideal is seldom attained; it is enough in most cases to temper our judgment and our curative measures by our experience, with the facts just mentioned in mind. Power transmission specialists, of course, usually compute the requirements of a drive that is under consideration to a very fine point, and if you are in a position to obtain their advice on any troublesome drive, so much the better.

In general, if you are troubled with a slipping drive, it is well to remember that the coefficient of friction of a belt under actual operating conditions is of the highest importance. We may as well face the fact that if we have an oily or greasy belt, we will have trouble continually until we find a way to keep the oil off the belt. However, aside from the oily belt proposition, certain types of pulleys and certain types of belts have the highest frictional ratings, and these are the natural ones to use if trouble is experienced with excess slippage. Pressed paper pulleys, such as often used on motors, rate highest in frictional properties, with wood a reasonably close second. As for belting, special mineral tanned leather stands at the top of the list in frictional qualities, with rubber-fabric belts next.

One frequent consideration in the design of a belt drive has to do with the proposition of decreasing center distances between pulleys, where one of the pulleys is considerably smaller than the other. It will be appreciated that as you shorten your distance between centers, the arc of belt contact will increase on the larger pulley and decrease on the smaller, so that the drive will be less effective, since it is always at the small pulley that slippage may develop. One may, therefore, at the expense of lengthening the drive, make it more efficient. Considered strictly from the cost standpoint, it is a fact that at times one can shorten such a drive, and get the same belt-contact area on the smaller pulley by using a wider belt. Again, there are times when space available for the drive forces the use of short centers. In such a case, if for any reason a pivoted-motor-



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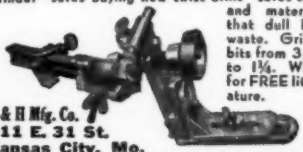
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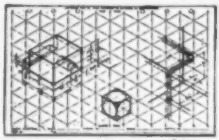
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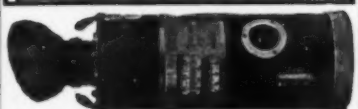
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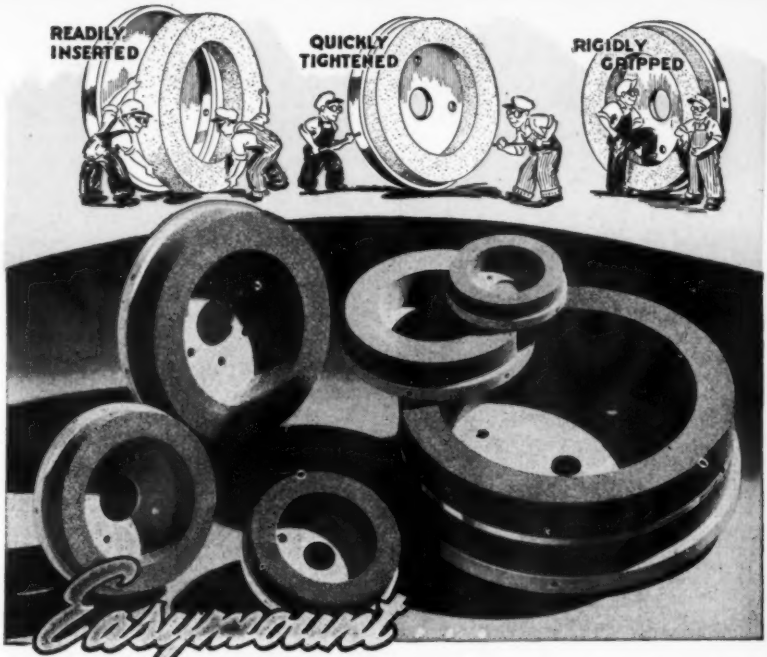
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base drive or a wrapper-pulley arrangement is not possible, it is well to remember and consider the application of wider belt and wider pulleys.

Other things being equal in an ordinary open belt drive, the horizontal drive is the more efficient, with the tight strand of the belt on the bottom, because in that position, the upper strand of the belt sags down by gravity from pulley to pulley, maintaining proper tension and a greater arc of contact on both pulleys. However, as you begin to slant a drive away from the horizontal, the amount of power it will transmit does not diminish appreciably until the slant reaches approximately 45°, for the same principle of the sag of the upper strand remains true in a very appreciable degree. When you reach and pass the 45° slant, going toward a vertical drive, the efficiency progressively and appreciably diminishes.

One authority has claimed as a safe rule to follow, that after reaching a 45° slant, the percentage of efficiency as compared with a horizontal drive may be estimated quite closely by subtracting the angle of inclination from 145°. Thus, subtracting a 45° proposition from 145°, we obtain a theoretical 100% for the efficiency of the drive. With a belt inclined at 50° from horizontal, we would have an efficiency of 95%. Working on up to a vertical drive, you would have a drive only 55% efficient. Obviously, these figures are only approximate, but doubtless fairly close to the truth. Actually, in some cases (especially instances where the drive is from a large pulley above to a small pulley below) a strictly vertical drive should be avoided, unless something like a pivoted motor base is being used, to hold a reasonable amount of tension in the belt regardless of high or low humidity. In computing horsepower as touching inclined drives, it is of course assumed that one understands how to first compute or estimate it for a horizontal drive.

Regarding flexibility, it is obvious that the thicker a belt is, the less flexible it is, and it is never wise to use a very heavy belt on a small-diameter pulley. In general, it is a good idea never to use



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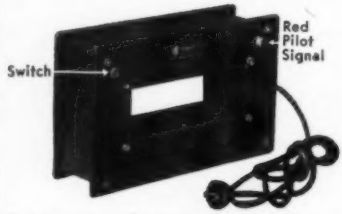
For "A" section V-belts—3.3—1 speed range—perfect belt alignment in all positions. Priced so low that no shop or machine need go without infinite speed selection. *See your dealer or write* $16.50

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a double-ply belt on a pulley less than 12" in diameter, and never to use a triple belt on a pulley of less than 20" diameter. In a case where one must carry more horsepower on a given belt than the allowable tension will provide without violating the foregoing, it is in order to increase the width of the belt and the pulleys to meet the emergency, or else increase the diameter of both pulleys to a point where the heavier belt may be run without damage. In the latter case, keep carefully in mind the dangers of too high velocity as already set forth. Bearing loads, too, must be considered sometimes. If the bearings with which you have to deal are not large enough to carry as much belt tension as you are using on a drive, you must again consider the larger pulleys or the wider belt, so that an equal amount of horsepower may be transmitted with less belt load on the bearings.

It is believed that these observations will be helpful in the average shop where it is necessary to install an occasional belt. In cases where some extraordinary problem is encountered, it will usually be best to obtain help from a power transmission specialist, rather than to take a chance on doing the wrong thing. Such firms can always work out the horsepower on a drive very closely, for they have developed tables of factors answering to different arcs of contact that belts make with pulleys, and the influence of these various arcs on the amount of power transmitted. Likewise they have full data on other factors which are obscure to the average plant beltman.



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27th National Metal Show

PLANS have been completed for the first great postwar industrial show with the announcement of the 27th National Metal Exposition to be held in Cleveland's big Public Auditorium from Monday, February 4 thru Friday, February 8, 1946. Originally scheduled for October of this year, the event was moved back to February to avoid any interference with heavy wartime transportation demands, according to W. H. Eisenman, Managing Director of the Exposition and National Secretary of the American Society for Metals, sponsor of the event.

"This industrial show will be the largest ever held in America", Mr. Eisenman said. "Because of the widespread advance interest in the Metal Exposition, the floor plans which have been mailed to previous exhibitors this week showed a greater area of exhibit space than any event of this type in the history of U. S. industrial shows."

"This interest in the Exposition indicates that manufacturers are ready for reconversion and eager for the opportunity to show the new machines, materials and processes that have been developed in war and to demonstrate their possibilities for high peacetime production", Mr. Eisenman continued.

"For the first time in four years", he added, "the Metal Show, as it is generally known in industry, will be a forthright effort on the part of exhibitors to sell their products."

Mr. Eisenman pointed out that the Exposition would again be held in conjunction with the National Metal Congress with the result that thousands of metal men will not only see all the new products in operation at Public Auditorium but will also have the opportunity to hear the outstanding research papers presented by scores of engineers and technical experts.



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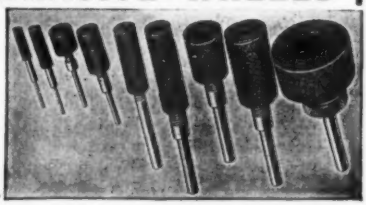


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LOOKING AHEAD

By GEORGE S. BENSON*

RESEARCH

A SALESMAN representing a firm of efficiency experts managed, several years ago, to gain admission to the office of a small manufacturer, one who employed fewer than 200 people. The solicitor made a sale. He induced his prospect to hire the services of the system fixers, who, he promised, would show the owner how to save a great deal more of his factory's annual earnings.

After contracting for this rather high-priced advice, the owner of the business was impatient for results. He could hardly wait for the first "expert" to come and prune out needless expenses. Less work and more profit on the same volume always seems attractive. Finally came a polished man of 40 with a chisel-shaped nose and spectacles with conspicuous rims.

He Liked Action

The owner of the plant and his hired adviser walked solemnly together through offices and shops. They were returning to the main office when the expert's eye fell upon an idle man— an old man, sitting at a desk looking out of a window. As soon as they were out of ear-shot, the expert exclaimed: "That old fuddy-duddy is a net loss. Discharge him! he is just sitting there dreaming."

"Do you suppose he is dreaming?" inquired the owner of the factory. "Day-dreaming, to be sure," replied the expert. "Well that's just fine," said the owner. "Now we won't be needing your help. Every so often that old chap has a day-dream, and the cheapest one he ever had was worth half a million dollars to this business. Don't disturb him as you go out."

Ideas Have Life

Creative work has its peculiarities. It takes place inside people's heads, and superficial critics don't look that deep. First comes the germ of an idea; then careful analysis. Since no one person can know all about anything, research is necessary. Research is costly too, because it must be carried on by men who have special knowledge and special skills.

Inventions don't go into production direct from the dream stage. Manufacturing profits begin when multiplied copies of an invention start coming off the assembly line, but mass production permits no guess-work. The dream is necessary but numberless laboratory tests and exhaustive practical experiments must pave every invention's road to market. Many a good idea has died unworked for lack of research—too costly.

Increase the Yield

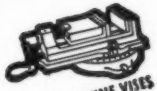
In America are many factories—geese able to lay golden eggs, such as employment, prosperity and progress. The fertile 14-carat gander in the flock is Research. Without this motivating influence industry may start its post-war program and pursue a well charted course, efficiently amputating cost after cost until there's nothing left to cut off, but it's the road to ruin.

Not many weeks ago I read a scathing criticism of American business. In it the author hoisted a red flag in warning against capitalism. He pointed to hundreds of thousands of dollars spent annually in industrial research by a mere handful of wealthy corporations. I have only this to say: I hope they spent all he said and more, because the brightest spot in the outlook is research.

---

*President, Harding College, Searcy, Arkansas

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POWER HACK SAWS



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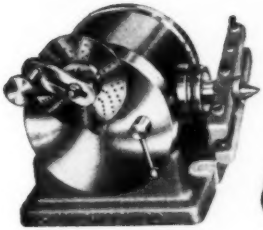


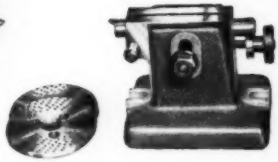
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Model AU — Full Universal For Complete Indexing and Spiral Cutting . . . $194.65



Model BP For Plain Milling Machine

$128.55

Surprisingly low in price, yet built to high quality standards, the new L-W 11" Universal Dividing Heads offer utmost accuracy at a cost lower than any comparable equipment on the market. The unit is constructed with many new features to increase their accuracy and their use for practical, profitable shop work.

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★ TAILSTOCK—New design, heavier and stronger.

★ HEADSTOCK SPINDLE — Tapered bearings, bored for No. 10 B & S Taper. Increased diameter and length. Threaded nose, 2¼" diameter 10 thread USS.

★ WORM — Made from special alloy steel, accurately finished, and thrust taken by ball bearings. Provisions are made for easy accurate adjustment of worm wheel.

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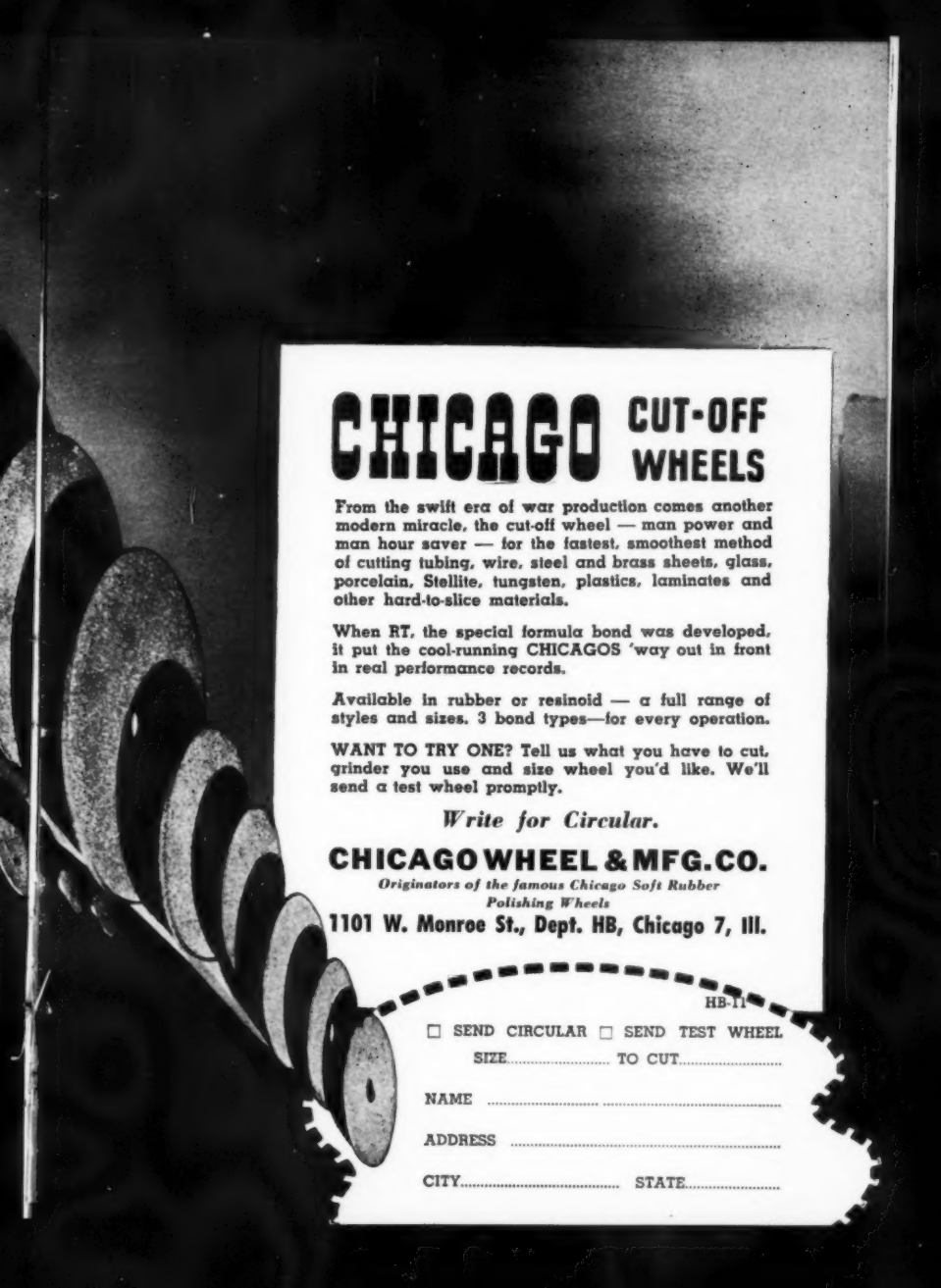
★ EQUIPMENT — ⅝" table slot tongues, three index plates furnished, dividing all numbers to 50, and even numbers to 100, with the exception of 96T. Index chart furnished shows all divisions obtainable to 380.

When ordering AU Heads, specify either right or left hand model.

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From the swift era of war production comes another modern miracle, the cut-off wheel — man power and man hour saver — for the fastest, smoothest method of cutting tubing, wire, steel and brass sheets, glass, porcelain, Stellite, tungsten, plastics, laminates and other hard-to-slice materials.

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Available in rubber or resinoid — a full range of styles and sizes. 3 bond types—for every operation.

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☐ SEND CIRCULAR ☐ SEND TEST WHEEL

SIZE..... TO CUT.....

NAME .....

ADDRESS .....

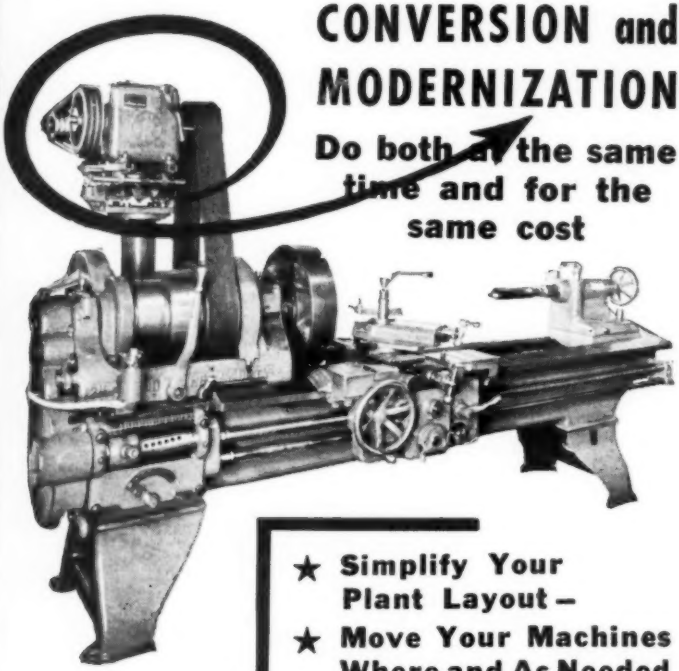
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STUDY THESE KRW FEATURES IN TERMS OF YOUR MANUFACTURING OPERATIONS . . . *Your profits!*

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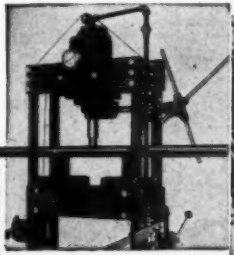


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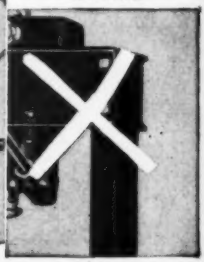


★ **CONVENIENT PUMP HANDLE LOCATION.** The only correct pump handle location is slightly below a man's waist level. There's no straining to pump awkwardly, creating worker fatigue. Operator is free to watch the near-eye-level pressure gauge.

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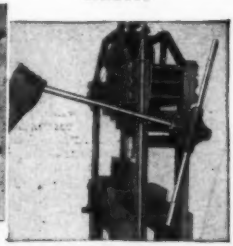
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★ Here, on these pages, you can see the proof of KRW superiority... no other hydraulic arbor press can boast of these money-saving features. Before you buy any other make of hydraulic arbor press, check their value to you in terms of your own daily operations... manufacturing costs...employee morale...and Profits. Many operations that can be done easily on a KRW Press cannot be handled at all on other makes of presses. Using simple, inexpensive dies, it is possible to perform many bending, straightening, flattening, offsetting, assembling and other operations at lower cost per unit. Investigate ... our special Hydraulic Press Catalog will give you all the facts you want. Write for it today.

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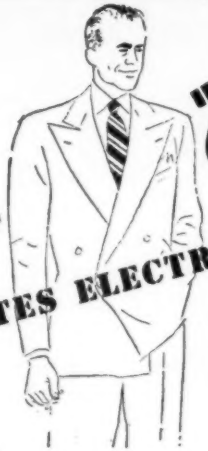
★ **"BUILT-IN" MECHANICAL ARBOR PRESS.** Provides the advantages of the large adjustable press bed... makes possible the use of V-Blocks where necessary. Hand wheel operates the ram mechanically with 3 to 4-ton pressure. You can switch to hydraulic pressure by flipping the valve control.



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BUFFALO 3, NEW YORK

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UNITED STATES ELECTRICAL TOOLS



IT'S like saying "hello" to an old pal who's been hard to find for the past three or four years . . . and we appreciate your indulgence. But UNITED STATES ELECTRICAL TOOLS have been on the job for Uncle Sam . . . and now they're back on the job for the millions of his nevvews who are on their toes and straining every muscle to turn out "the mostest and bestest for the leastest."

"Thanks a million"

And that's from the heart . . . you've been wonderful all through the war years. The UNITED STATES re-conversion program is complete and we're right back into production. Send your orders . . . your distributor can take care of you.



PRECISION LATHE GRINDERS Model XX

For internal or external grinding. Ball bearing grinding wheel spindles interchangeable on corresponding sizes. For use with lathe, planer, boring mill, milling machine, etc. Vertical or horizontal position. Spindles equipped with matched precision ball bearings in dust-proof housings.

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Trends ON THE PRODUCTION FRONT

SECTIONAL CARBIDE NIB MOULDS

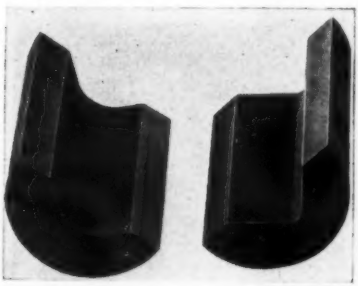
THE production records achieved by sintered carbide tools and dies may now be duplicated by sectional carbide nib molds, Firth-Sterling Steel Co., McKeesport, Pa., announced recently at the conclusion of six years of experiments into this branch of powder metallurgy.

William J. Loach, superintendent of sintered metals at Firth-Sterling, who has compiled the results achieved by the revolutionary new molds in test installations operating in a group of key industrial plants, affirms that the sectional nibs have produced per grind from seven to 10 times the number of compresses possible with steel molds; that they have equalled or surpassed the production of solid carbide nib molds, and, in addition, may be re-cut, with the production after each re-cutting being equal to production of the original mold.

Specifically cited by Mr. Loach, in announcing commercial availability of such molds, was the case history of a plant engaged in pressing tungsten-silver electrical contacts. The tool steel molds originally used operated in connection with hydraulic presses exerting a pressure of 40 tons psi. When this set-up proved incapable of producing points dense enough to reduce burning, and when such molds had to be discarded after 12,000 or fewer compresses, the decision was made to shift to sectional carbide nibs and carbide-tipped plunger. Simultaneously the manufacturer stepped up the pressure from 40 tons to 60 tons and, then, to an unprecedented 70 tons.



The nib, now spotted, is ready for the grinding jig.



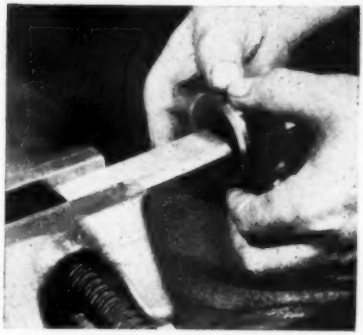
Preformed sectional sintered carbide nibs originated by Firth-Sterling Steel Co.

After 27,000 compresses had been achieved with the new set-up, the copper brazing holding the carbide tip to the steel plunger failed. The manufacturer ordered a redesigned plunger of solid carbide, shrink-fitted into the steel shank. With this change, the mold continued in service from 27,000 to 124,000 units, at which time the mold was ex-

amined and found to have worn less than .001". The plunger was redressed, .008" being removed from its head. The engineer on the job, after noting that the mold had worn less than .001", and that the tolerance permitted on these electrical contacts is .005", estimated that the mold should be good for 500,000 compresses before re-cutting would become necessary. The estimated number of re-cuts of this mold, based on the amount of carbide stock in the nibs, is reported to be five, which forecasts a production of 2,500,000 units during the complete life of the mold.

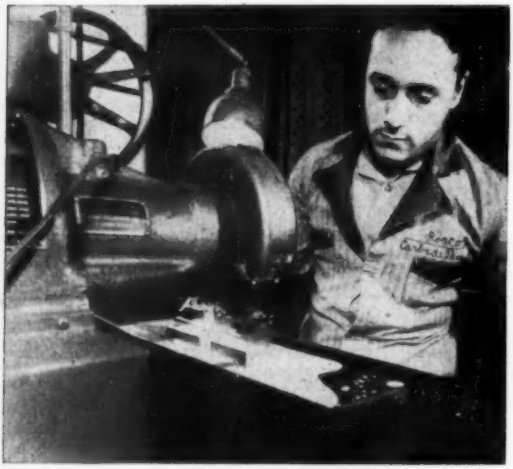
Regular operating test runs of the new type molds in other plants indicate that production of 500,000 pieces per cut are commonplace, Mr. Loach reports, adding that a substantial number of molds now in operation have been re-cut as many as five times, and that 10 to 12 re-cuts would seem to be entirely practical in many instances. Specifications governing amount of stock in the original sintered carbide nibs in such molds is determined by the anticipated production, as the re-cutting has proved to be not only practical but economical.

The sectional nibs in existence are made of Firthite of a hardness determined by the metal powder to be compressed. The test applications to date have covered these powdered metals:—carbon, brass, bronze, copper, iron, tungsten, and tungsten-silver. A substantial number of new type molds also are being used in connection with pellet presses for compressing pharmaceutical powders.



Hand-lapping the mold with diamond powder.

Tool steel molds, according to Mr. Loach, have averaged approximately 6,000



Grinding of the sectional nib to exact size is done with a diamond wheel on a surface grinder.



STANDARD MICRO-ADJUSTMENT STUB TAPER

Glenzer ADJUSTABLE ADAPTERS

Allow Tool ADJUSTMENT in Multiple Spindles

These Adapters have proved their worth over the years and are now commonly used in multiple spindle operations. Are you using the type best suited to your needs?

Adjustment is made by nut on Acme threads, positive drive through Woodruff Key and holdback friction through Allen set screw.

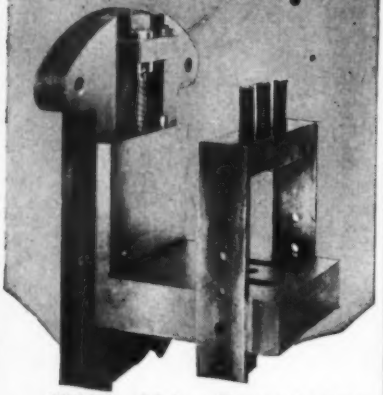
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No. 51-A Indexing Head



No. 51-B V-Block & Clamp



No. 51-C Die Plate Fixture

Boring die and bushing plates . . . turning off-set diameters . . . cutting eccentrics and compound angles . . . machining irregular work . . . and many other special lathe jobs can be easily performed with this lathe angle plate and accessories . . . eliminating the need for costly special jigs and fixtures, and saving valuable man hours!

Virtually a tool makers angle plate, this unique work positioning fixture is heavily constructed and precision ground throughout. It is easily attached to the face plate of a lathe and is available with accessories in two sizes: No. 51 for 12", 14", and 16" lathe; and No. 52 for 9" and 10" lathes. Write for complete details today.

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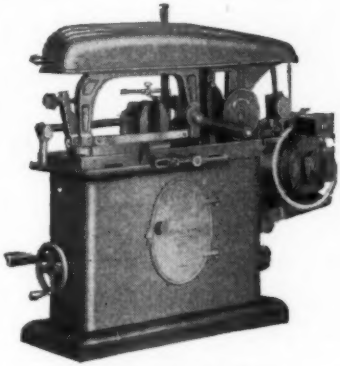
Fitting plunger to the mold. Tolerance is .0003" on each side.

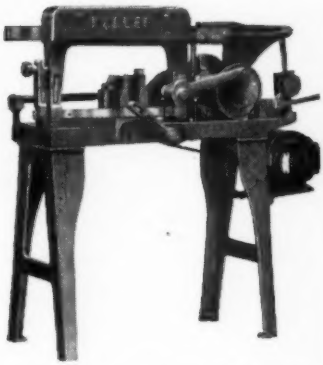
units when compressing tungsten and some 30,000 units when compressing the relatively unabrasive powdered carbon, before being discarded. The Firthite sectional nib molds have averaged better than 70,000 units per cutting in contrast to tool steel's general average of 10,000.

Sintered carbide has proved its ability to resist compression loading with its compression strength of some 700,000 pounds psi. Decision of Firth-Sterling to shift from solid to sectional nibs followed persistent observation that a sharp corner in a solid nib subjected to load doubles, triples or further multiplies the stress, depending upon angle and sharpness of the corners. It was noted that under such repeated stress, high local stresses at the corners caused fatigue failure by cracking and chipping. Recutting of solid nibs was only possible by hand, which was impractical. By comparison, lapped seams in the sectional nibs achieved "controlled" cracks comparatively free from trouble and insuring full life for the molds. Sectional nibs, it is thought, eventually will make it possible for the user to finish his own molds.

KELLER

POWER HACK SAWS





NO. 3 HY-DUTY

PRICE INCLUDING MOTOR

$300 F.O.B. FACTORY

NO. 3-B DRY CUT

PRICE INCLUDING MOTOR

$125 F.O.B. FACTORY

SPECIFICATIONS

Capacity, 6-3/4 x 6-3/4 inches.
Vise swivels to 45 degrees.
Capacity at 45 degrees, 4 inches.
With automatic safety stop switch.
With feed control.
With foot lift to saw frame.
Automatic lift on reverse stroke.
With coolant tank and pump.
Length of blade, 12 to 14 inches.
Two speeds available, by shifting belts.
100 to 168 strokes per minute.
½ H.P., AC, 1,725 R.P.M. motor.
Height from floor to top of vise, 22½ inches.
Weight complete with motor, 580 pounds.
Weight complete crated, 634 pounds.
Floor space, 13x27 inches. Length, 40 inches.

Capacity, 6-3/4 x 6-3/4 inches.
Vise swivels to 45 degrees.
Capacity at 45 degrees, 4 inches.
With automatic stop, electric switch.
Length of blade, 12 to 14 inches.
Standard power blades used.
Two speeds available, by shifting belts.
70-125 strokes per minute.
Automatic lift on reverse stroke.
¼ H.P., AC, 1,750 R.P.M. motor.
Height from floor to top of vise, 25 inches.
Weight complete with motor, 275 pounds.
Weight complete crated, 325 pounds.
Floor space, 13x27 inches.
Total length, 40 inches.

Several Other Models Available

See your local dealer, or write direct to us.

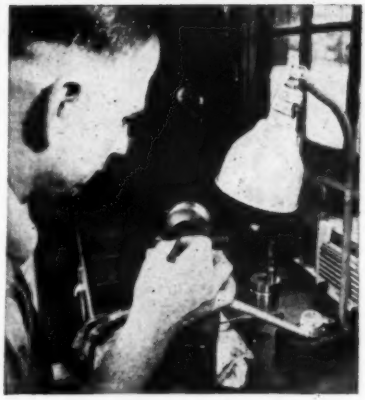
SALES SERVICE MACHINE TOOL CO.

2426 UNIVERSITY AVE. **ST. PAUL 4, MINN.**

Major advantage of the sectional as opposed to the solid nib, it is pointed out, is the fact that the nib may be re-cut and that life of the mold is limited only by the amount of stock which is removed. Re-cutting to original size is advantageous for both standard shapes and special shapes that call for long production runs, because worn molds are reclaimable.

It is also pointed out that, by keeping one spare mold on hand to be used while a worn mold is being re-cut, production may continue without interruption.

In addition to being re-cut to original size, a sectional nib mold also may be re-cut to larger size within limits of the nib diameter. This salvaging of materials, combined with savings in machining them in the re-cutting process, reduces overall mold costs to about two-thirds of the original cost.



Gaging the mold size.

MECHANIZING THE FOUNDRIES

CHANGES in labor supply and the availability of skills frequently determines trends in techniques and mechanization. The lack of certain skills in the foundry industry, due in part to dislocation brought on by the war effort, is presently affecting the situation in foundries. This has become so serious that unless a solution is found, either in terms of actual manpower or some form of mechanization the rate of reconversion to a peacetime basis in all manufacturing will be greatly retarded. Casting, both iron and steel, is fundamental to our manufacturing activities. Numerous industrial sectors, whose return to a peacetime basis could be accomplished in a very short space of time are actually refusing orders because of a lack of castings, both steel and iron. One large eastern manufacturing concern with a foundry as a component part of its organization is presently in this predicament. In this instance, labor rather than actual foundry skills is lacking. It is next to impossible to attract workers into such foundries tho thousands of war workers in this area were displaced on V-J Day. And this is typical

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LABORATORY GRADED
PURE DIAMOND POWDERS

STAR DUST speeds up production enormously and produces finishes and superfinishes down to less than .0000004 of an inch.

Precision LAPPING POWDERS for PRECISION work



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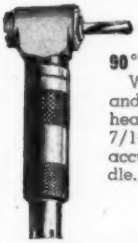
There is a STAR DUST Field Serviceman in your territory.

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NEW YORK 7, N. Y.



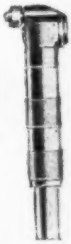
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Drill Those
HARD-TO-GET-AT-PLACES
WITH
STOW Flexible Drill Shafts and Attachments

● **Stow Flexible Drill Shafts can be chucked in standard electric drills. Makes drilling more accurate and less fatiguing.**



90° COLLET TYPE HEAD

With a Stow Flexible Shaft and a Park 90 deg. collet-type head, you can drill within 7/16 of angle corners with accuracy. Direct-geared spindle.



90° ANGLE HEAD

This Park 90 deg. angle head has offset spindle and patented chuck. Drills within ¼" of angle corners and other similar tight spots.



45° ANGLE HEAD

For especially close quarters — use the Stow Flexible Drill Shaft with Park 45 deg. angle head. Takes any size drill up to No. 30.

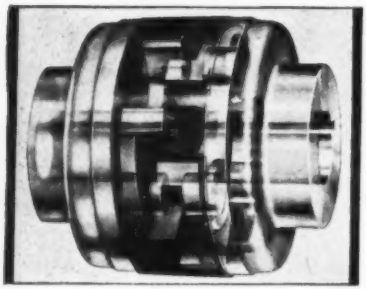


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"O-P" MULTIFLEX COUPLINGS

THREE UNIT SAFETY SMOOTH DESIGN

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A MASTER-PIECE
FOR PRODUCTION

Today — and in the tomorrow — the transmission of power is a vital factor. MULTIFLEX COUPLINGS were designed to transmit that power under all conditions. MULTIFLEX COUPLINGS give greater MULTIFLEXIBILITY against heavy shock and pulsating loads in any direction, also compensating for ANGULAR and PARALLEL MISALIGNMENT. So — for insured production order MULTIFLEX COUPLINGS.



of many other industrial plants. Thus, reconversion to a peacetime basis is being seriously retarded.

Some of this manpower shortage will be relieved as the economic situation of war workers changes. Once savings are dissipated and job insurance is no longer available, some of these workers will be attracted even by jobs in the foundry. But not too much reliance can be placed in this possibility nor can the urgent necessity for a return to normal be postponed. Mechanization of foundry operations will be undertaken and attempts will be made to fill these deserted operations with machinery.

This mechanization will proceed along the lines of the laboring operations in such foundry departments as shakeout and casting cleaning. Much has already been done by way of introducing machinery for the actual job of making the molds. But little to date has been accomplished by way of replacing the laborer on the shakeout floor and the cleaning department.

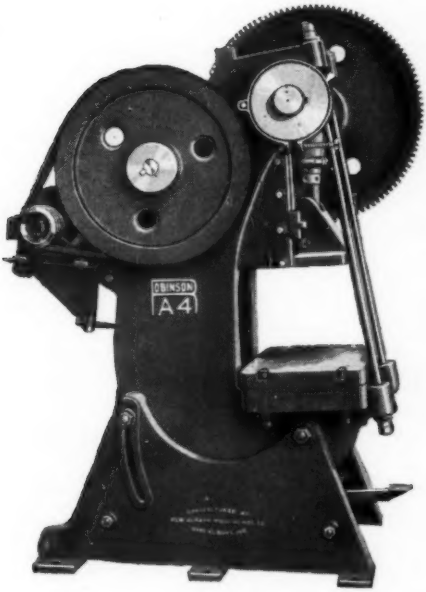
The tendency is towards vibrating and impact machines to take the place of the customary operations necessary to shaking the sand, both from the mold and casting cavities. Much more, however, remains to be done along these lines and we can expect to see manual operations now necessary for these jobs replaced by machinery.

The cleaning of castings presents another sort of mechanization problem. The hydraulic cleaning of castings, using high pressure water lines, has been used successfully in the larger foundries. It remains to adapt this type of equipment to the smaller foundry and to all classes of castings.

Snagging operations on castings have always been performed with abrasive wheels and similar equipment. The manual operations necessary for these jobs are difficult and disagreeable. Much can be done to improve them from a human standpoint. Much also can be accomplished by the application of more advanced machinery and equipment. The tendency in this connection is toward the use of carbide grinding wheels that have recently been developed and made available for this type of operation. In effect they are flat discs or rotary files of sufficiently large size to remove the remains

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for their durability strength & service



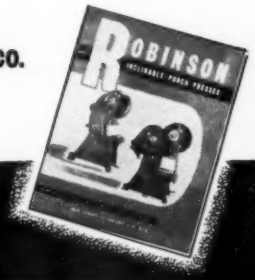
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Send for Bulletin No. 7, shown below, which gives complete specifications and detailed information.

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Send now for Reference Bulletin No. 100 — in concise form it describes and illustrates 100 standard counters.

Illustration: Model 5-D-1, light duty Stroke Counter installed on Delta Drill Press gives operator precise count of work turned out.

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128 Orange St. Providence 3, R. I.

of heads and risers that have previously been flame cut.

These and other tendencies are noticeable in the foundry industry at the moment. The progressive manufacturer of foundry and molding equipment is aware of the need resulting from the current manpower dislocation and will, no doubt, attempt to meet it with typical American ingenuity.

What such mechanization means to the permanent labor situation as well as to the foundry industry would be an interesting subject for discussion by industrial economists. Manual operations once converted by mechanization never revert to hand labor. This means a definite decrease in available jobs. Moreover the effect on industry itself is also noteworthy. Mechanization means that some of the smaller foundries may cease operations; the capital required for equipment can be supplied only by the larger companies. And with increasing mechanization forced upon the foundries the mortality rate in this industry, whose roster always included a very large percentage of small companies, will rise rapidly.

For better or for worse, however, mechanization in foundry operations seems inevitable.

"CANNING" SURPLUS MATERIALS

THE "canning" in aluminum of valuable war surplus materials, running all the way from heavy machine tools to delicate instruments and electrical apparatus, has been announced as one of the peacetime projects of the Glenn L. Martin Co., Baltimore 3, Md.

The development of ingenious aluminum "barriers," some of which "breathe" thru drying agents and others of which are hermetically sealed, has come about thru experimental contracts with the Ordnance Department of the Army for the canning of guns. It has been determined that by such methods, all sorts of manufactured articles and materials can be stored in the open for many years without rust, corrosion or deterioration.

By eliminating the necessity for warehousing, this development solved one of the great problems confronting those interested in the storage of surplus war materials, permitting the storage of "can-

AND NOW FOR THE GOAL OF CIVILIAN PRODUCTION

Let's hope cannon balls can be put away in moth balls for a few generations at least . . . let's forget Mars and wars and get back to normal in as big a way as before.



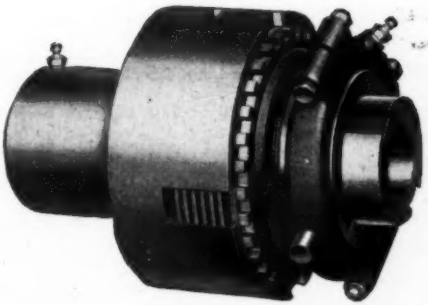
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Model ZL 805 6-plate sleeve clutch for operation in oil.

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DETROIT 2, MICHIGAN

ned materials" in the open on Government reservations or other open spaces owned by private concerns.

In announcing the post-war project, which conceivably can run into big business and occupy all of the surplus plant space of the airplane company, Glenn L. Martin, aviation pioneer and president of the company, declared that billions of dollars worth of equipment made during the war could be saved for future market. Otherwise, he pointed out, it might lose all but junk value or else expend all its true value in expensive warehousing and constant maintenance before it could be used again.

Mr. Martin also expressed the opinion that the new scientific "canning" process would be a boon to exporters and importers in the shipping and outdoor storage of valuable stocks. Not only can the contents be protected against any climatic or weather conditions, but a great saving can be effected over extended periods thru eliminating warehousing costs, as well as thru weight saving over heavy wood crating, thereby cutting shipping costs. Every pound of weight and cubic foot of volume saved represents a real saving in overall cost to the consumer, since he, and he alone, bears transportation costs. Anticipating a vastly increased use of airline freight, this factor assumes even greater importance.

Aluminum is used, Mr. Martin said, because of its resistance to corrosion, its lightness and because great surplus stocks and manufacturing potential are available.

One of the most interesting of the Martin devices is called the "balanced pressure barrier". The big can, now being tailored to fit field guns, actually "breathes" away moisture. At night and under cloudy conditions, the barrier inhales air thru a screen of silica gel, which has one of the highest known absorptive values of any desiccant capable of being reactivated. In sunlight it exhales air thru the gel, drying and reactivating the desiccant automatically. Accelerated tests of this process give a high promise that the contents can be absolutely protected without maintenance, for many years.

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machinery, engines, motors, instruments, communications equipment, typewriters, office equipment, wire and all sorts of electrical assemblies and thousands of other items mass-produced far beyond normal consumer needs would protect enormous private investments, Mr. Martin explained.

"For the first time in history, as far as I know, it is possible for industry, business and Government to take a leaf from the notebook of the farmer and the housewife in the canning of surplus," Mr. Martin said. "Until war-accelerated scientific developments showed us the way, only temporary protection, inadequate and costly, could be given heavy and expensive equipment that was surplus."

"SWAGING" FILM RELEASED

An interesting and informative motion picture film on the subject of "Swaging" is now available to educational, employer and employee groups.

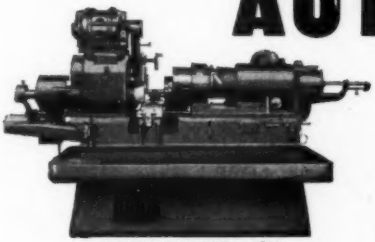
This 16mm film with sound commentary has been prepared in English, French, Russian and Spanish for preliminary distribution. Its 26-minute run gives a popular Hollywood style portrayal of the many applications of the "swaging process" in today's mass production methods for pointing, shaping, and attaching fittings to bar, cable and tube.

Steel — including stainless — copper, aluminum and even wood products are shown by the film to be included within the processing scope of the Swager and its derivatives.

The movies have been made available without charge by the Standard Machinery Co., Providence, R. I., where this and a short U. S. Office of Education movie on swaging were filmed. The educational film has been incorporated in the complete "Standard" film.

Copies of the film can be reserved for local showings with Maxwell-Roney, 35-36 76th St., Jackson Heights, L. I., The Swind Machinery Co., Philadelphia, Pa.; Wm. K. Stamets Co., Pittsburgh, Pa. and Cleveland, O.; Neff Kohlbusch & Bissell, Inc., Chicago, Ill.; Smith Booth Usher & Co., Los Angeles; and for export showings with Stanley H. Rose, 1111 South Ferry Bldg., New York City.

These CLEVELAND AUTOMATICS

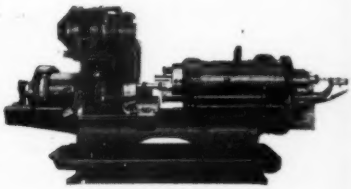


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and other standard models cut costs on turning and forming bar and tube stock from 9/16" to 10" OD



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James D. Davis says of the above picture:

Production Manager

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"You will note a battery of five Mattison No. 202 rip saws, the two end ones being equipped with your guide line lights.

Of course, you have an order on file for the other ones, and I do hope that you will be shipping these quite soon, as the operators would like very much to have them.

Of course, there is a considerable saving effected by the use of these lights, and the longer we are operating without them, the longer this saving is lost.

We have had excellent results with the equipment and right from the start the operators were most enthusiastic about it, which is rather unusual, as occasionally there is some objection to such installation."

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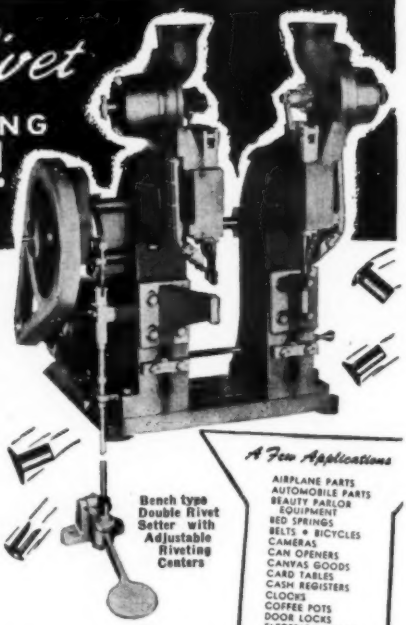
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Chicago Rivet

AUTOMATIC SETTING SLASHES UNIT COSTS!



If your product involves a fastening operation — wood to wood, metal to metal, fabric to fabric, composition to composition, or any combination of these — you can slash unit costs by increasing production volume with high speed Chicago Rivet Automatic Setters and Chicago Rivet tubular or split rivets. Four rivets are automatically fed, inserted and upset at one release of the foot pedal by the quadruple model Chicago Rivet Setter. Single, double and triple setters are also available.

Bench type Double Rivet Setter with Adjustable Riveting Centers



Quick change hoppers, available as extra equipment, enable some models to switch quickly from one size and style rivet to another. Nearly all models clinch grommets, eyelets, staples and Dzus fasteners and insert drive screws — all automatically.



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If your product is small, send us an unfastened sample. If it's large, send a sub-assembly. We will gladly analyze your fastening problem, recommend the type rivet and Chicago Rivet Automatic Setter needed and estimate production rates that can be set up on the job.



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Versatility of the Ball

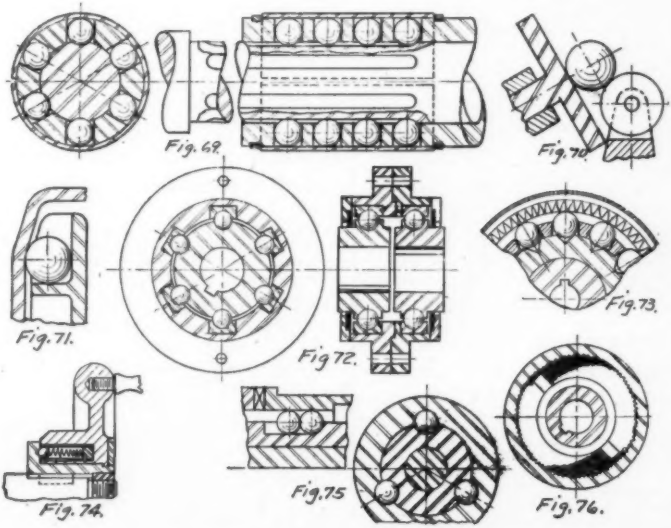
PART III — MODERN MACHINERY APPLICATIONS

By H. F. WILLIAMS

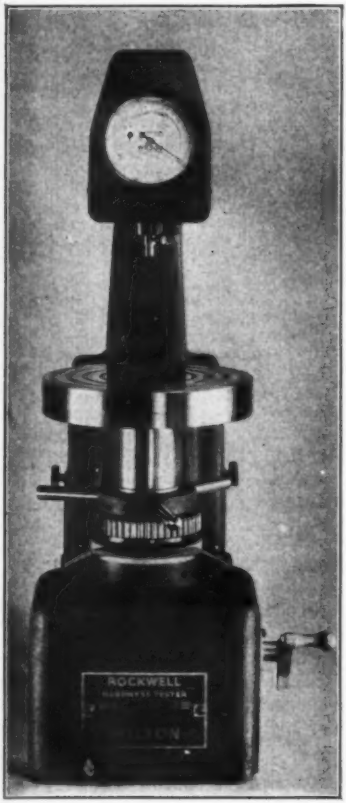
IN the safety clutch shown in Fig. 69 a series of balls allows longitudinal movement as well as driving rotatively. These balls fit into holes drilled in the driving member which can be seen in the left hand end view, cross sectioned thru one annular ball race. The balls engage longitudinal rounded slots in the driven shaft. A spring sleeve is retained endways by two snap rings. During operation, the driven shaft is free to slide along the rows of balls yet rotate thru engagement with the balls. Should the load become too great, the balls will leave the grooves in the driven shaft, the split spring sleeve expanding sufficiently. When the overload is released, the balls are snapped back into the shaft's grooves. Compactness and simplicity are the feature of this design.

A ball is used to transmit power from one element to another by point contact as is illustrated in the diagramatic sketch in Fig. 70. This is known as the Thompson transmission. The ball wedges between the cylinder and plate, causing rotation of two members when the other is driven. The speed of the drum or cylinder is constant when it acts as the driving member. By adjusting the position of the ball outward on the plate, the speed of the plate will increase. If the plate is the driving element, then the drum speed will increase as the ball is positioned outward on the plate. Rotation can be reversed if the ball is moved to the other side of the center of the plate.

A centrifugally operated collet-closing mechanism is illustrated in the partial



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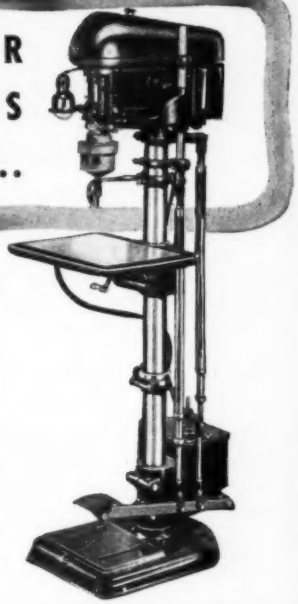
sketch in Fig. 71, which shows one of a number of balls used. The balls bear against the case at the left and are housed in a retainer at the right. This ball retainer is free to move axially and is the member connected with the drawback rod to operate the closing element of the collet. When in rotation, the balls, by centrifugal action, move outward. The balls ride along the inclined surface of the case, moving the ball retainer and subsequently the drawback rod to the right. When the rotation ceases, the balls return to their original position, and the ball retainer is moved by spring pressure to open the collet.

The Davis flexible coupling shown in Fig. 72 was designed to obtain 100% driving contact in all positions of misalignment and to be balanced in any position. The ball and socket principle is used in that 6 hardened and ground steel balls ride in movable socket keys. These hardened and ground socket keys slide in keyways cut into the outer ring of each coupling half and fit over the balls which are imbedded in the 2 hubs. During any misalignment up to 6° angularity, there is no change in contact area between the socket and the balls. The only change is the position of the sliding sockets in the two outer flanged members.

In the clutch arrangement shown in Fig. 73, a series of balls engage Vee-slots cut in the periphery of a flange integral with the driven member. The balls are nested in holes of a retainer riding on the OD of the driven flange. The balls are kept in engagement with the Vee-slots by a coiled or garter spring. When overload occurs, the balls are forced outward against the pressure of the spring, the latter expanding sufficiently to allow disengagement between the balls and slots.

So that screw pressure does not exceed a predetermined amount, a handwheel operated screw, as in Fig. 74, is arranged with a ball safety clutch. Three spring-backed balls are placed in the hub of the free turning handwheel. The handwheel is mounted on a sleeve keyed to the screw. The balls engage conically spotted holes in the sleeve. When the screw has exerted a predetermined pressure, the balls leave their socket, thereby allowing the handwheel to turn freely.

EVERY OPERATOR QUICKLY LEARNS PRECISION TAPPING..



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Special design of the new Procunier Universal Tapping Machine makes it possible for the most inexperienced operator to learn accurate tapping in an amazingly short time.

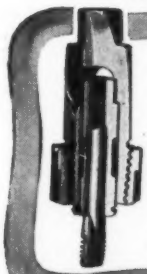
Two long, compensating springs take all of the "guess-work" out of the tapping operation . . . on both bottom and through tapping. Tap feeding and reversing pressures are preset and adjustable to the individual tapping job — *entirely* independent of the operator. These pressures remain constant, regardless of the pressure on the foot pedal. Dull or loaded taps are quickly spotted. Procunier low-cost tapping machines have many exclusive features. Send coupon for circular giving full details, specifications and prices.

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The Procunier Automatic Piston Type Lubricator supplies the correct amount of lubricant to the tap during the tapping operation.



TRU-GRIP TAP HOLDER

This tap holder drives the tap by the squared portion of the shank, keeps it in true by the round. The result is longer tap life, with no tap shanks "chewed" or damaged.

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When the balls click past these holes, it is an indication that the correct pressure is applied to the work thru the screw.

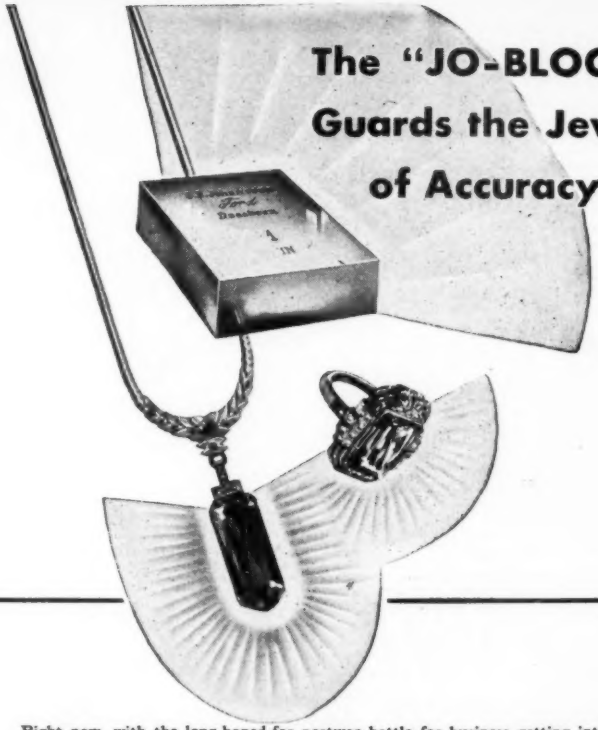
The dog-tooth clutch in Fig. 75 is so arranged that axial movement is taken on three sets of 2 balls each, spaced 120° apart on the circle. The clutch is driven rotatively, as can be seen in the right-hand end view, but is free to slide axially.

Small balls or chilled shot act as the driving medium in the clutch pulley and clutch coupling brought out in 1930 by Hill Clutch & Machine Co. Centrifugal force is employed to attain clutching. As can be seen in Fig. 76, there are two main parts to the clutch, namely an inner rotor carrying the impeller blades having orifices at their bases where they are attached to the shaft, and an outer shell in which serrations are cut in the periphery of the inner face. The impeller blades just clear the serrated surface. End plates held in place by snap rings retain the shot in the serrated casing. At rest, the shot lie in the bottom of the shell. When the motor to which the impeller is attached is started, the shot piles up before the blades, and as the speed increases, centrifugal force acts to pack the shot tightly into the serrations. If any overload occurs and the speed decreases, the packed shot slip out of the serrations until the overload is reduced.

Small hardened steel balls have also been used in shock absorbers in place of oil in a patented arrangement by American Steel Foundries. These small balls, immersed in heavy oil or grease, were used where close fitting is eliminated, as in the use of oil. The clearances can be just smaller than the balls. Space both sides of the piston in the shock absorber was completely filled with these small shot. Slots in the piston head permit transfer of the balls from one side to the other.. It is claimed that because of the large clearances permissible, internal boring of the cylinder is not necessary, as a good cast surface is sufficiently accurate to assure proper functioning.

Steel balls are used in the ratchet shown in Fig. 77 which gives practically silent operation. The power is transmitted thru the inner member, and the hooked surfaces pick up the balls and carry to engagement with the outer member. The

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Right now, with the long-hoped-for postwar battle for business getting into full swing, the establishment of high standards of shop accuracy becomes all-important in thousands of plants.

Don't let the hurry of reconversion sidetrack this basic precaution. Protect the performance of your product—make assembly easier—provide parts interchangeability—with genuine Ford Johansson Gage Blocks.

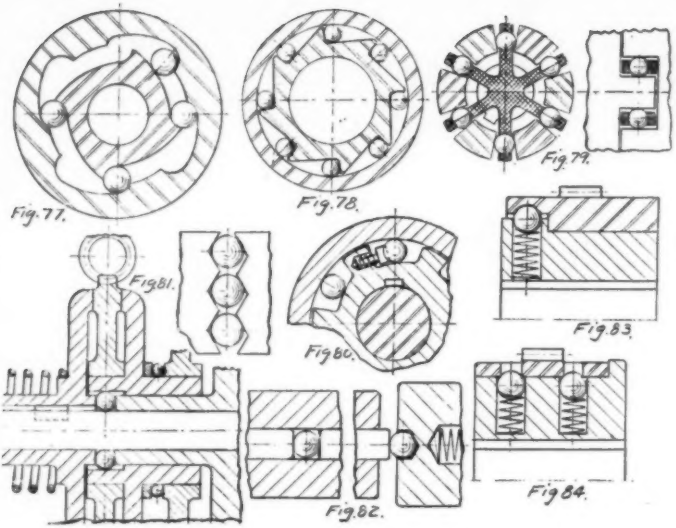
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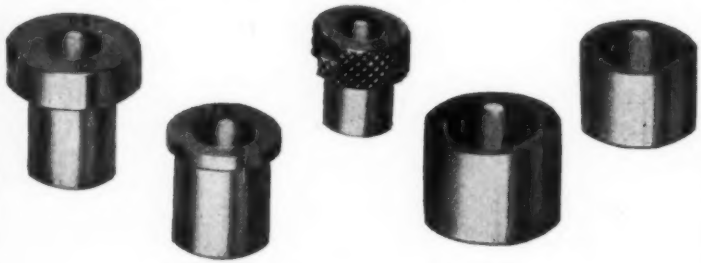


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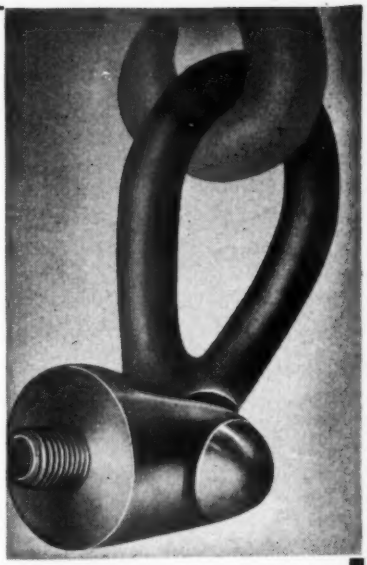
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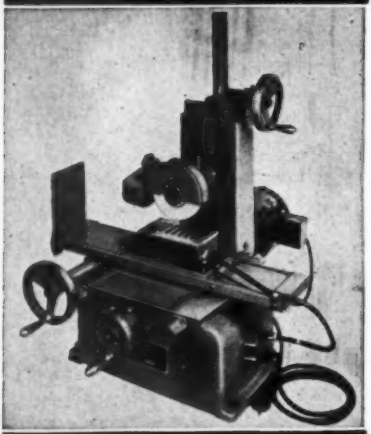
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sketch shows only three balls in engagement, the upper one having been released by gravity. There are no springs in the mechanism, as it is not operated on the friction principle. The outer member can also act as the driver. The grooves, which are of special shape, need not be machined if requirements of accuracy are not great.

In another form of ratchet employing balls as the connecting medium, the design shown in Fig. 78 is simple. When the inner or toothed member is the driver, positive drive in clockwise, as the teeth force the balls ahead of them to wedge. If the outer member is the driver, positive rotation is counterclockwise. Clearances between the driver and driven can be made to suit, depending on the freedom required. In the sketch, these clearances are quite small, to keep backlash as low as possible.

The flexible coupling in Fig. 79, patented and manufactured by Boston Gear Works, uses balls between the three jaws each in the driver and driven members. The jaw surfaces, as well as the balls, are hardened. The balls are retained in a central spider. The design, it is said, makes greater flexibility possible over a plain jaw coupling in that it permits greater end play of the motor shaft. When this end play occurs, the balls roll along the jaws so that friction is overcome to a great extent. The couplings are only 2-3/16" in length, having a diameter of 1½". They transmit 13/16 hp at 300 rpm.

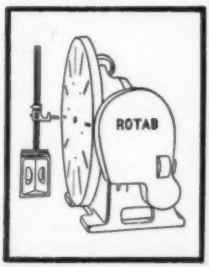
Silent, or so-called free-wheeling clutches make use of either balls or rollers as the driving connection, depending on power requirements. In Fig. 80, balls are used. The inner member is machined with a cam surface, the right hand side of which is shorter than the diameter of the ball. This then forms a powerful wedge with the bore of the outer ring. The balls are backed by spring-operated pins. These pins have cupped ends to fit over the balls. In other designs, depending on the number of balls used and the space available between slots, longer springs, large enough to nest over the ball, can be used and will centralize themselves on the ball. Thus, in this type

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of friction coupling, the balls are always in engagement to drive in one direction. It will be seen that if the outer member should be rotated faster than the inner member, the wedging effect is broken.

Balls are used as a power-disengaging medium in Fig. 81. The main shaft is so arranged that it can be rotated either by hand or by power. When power driven, the worm at the top of the illustration drives the worm wheel. This wheel is free running on the right hand spring-loaded clutch member, while the left hand clutch member is keyed to the shaft being driven. The handwheel, part of which is shown at the far right, is mounted free on the shaft. Altho not shown in the illustration, this handwheel is retained by a small flange at the right hand end of the driven shaft, end thrust being taken against a ball thrust bearing. The inner end of the handwheel hub is serrated as in the auxiliary view. Serrations are also cut on the end of the clutch member at the left. Steel balls nest in these serrations. When driven by power, the whole assembly, including the handwheel, rotates. But when it is desired to operate the shaft thru the handwheel, the power drive is unclutched by the action of the balls, which ride up the incline of the serrations. This action compresses the coil spring, thereby disengaging the clutch. Further rotation of the handwheel then drives the left hand clutch, thereby rotating the keyed shaft. When the handwheel is released, the power drive is automatically engaged. The balls then have a slight clearance in the serrations. The auxiliary view shows the position of the balls when the hand feed is in progress.

In Fig. 82 is illustrated in part the internal mechanism of a clutch in which hydraulic pressure operates by balls and rods thru the center of the drive shaft. The spring-loaded member at the right is a hydraulic piston, which operates the clutch plate flange.

Gear safety couplings are shown in Figs. 83 and 84. In Fig. 83 the keyed hub contains several spring-backed balls which engage slots or dimples cut into the counterbored hole in the gear. The number of springs and the load on these springs is made to suit the installation. In Fig. 84 a number of holes are drilled in the hubs of the gear. The spring-loaded balls engage these holes.

In a forthcoming issue of the Blue Book the fourth and last installment of this series of articles will include the use of balls in the design of vises, clamping devices, jigs and tools, gauges, valves, rollers, joints, screws, burnishing and broaching, detents, pumps and brakes.

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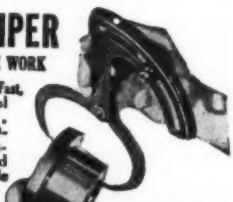
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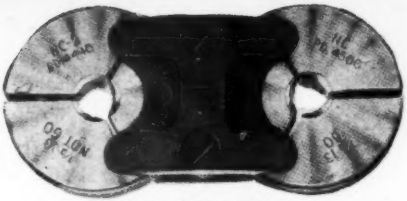
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4-48	.0985NF	10.53
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6-32	.1187	9.72
6-40	.1227	9.72
8-32	.1447	9.72
8-36	.1469	9.72
10-24	.1641	9.72
10-32	.1699NF	9.72
10-32	.1707	9.72
14-24	.2161	11.93
1/4"-20	.2188	8.10
1/4"-28	.2279	8.10
5/16"-18	.2764	8.10
5/16"-18	.2767	8.10
5/16"-18	.2779	8.10
3/8"-24	.3491	8.64
3/8"-36	.3570	14.36
.390-27	.3659	12.69
1/2"-20	.4688	9.18
1/2"-28	.4770	15.25
1/2"-32	.4799	17.69
5/16-20	.5300NS	13.04
5/16-24	.5354NS	13.55
5/16-24	.5357	17.33
5/16-24	LH	17.33
9/16"-11	.5681	9.18
9/16"-24	.5979LH	15.75
11-24	.6604NS	14.95
3/4-24	.7229NS	16.81
11-10	.7476NS	14.94
7/8-9	.8028NC	12.24
7/8-12	.8209NS	14.70
7/8-18	.8389NS	12.43
7/8-20	.8428	9.02
7/8-24	.8479NS	17.57
1-12	.9459NS	16.10
1-16	.9594NS	16.61
1-18	.9639NS	17.53
1-24	.9729NS	19.89
1 1/16-20	1.0300NS	18.42
1 1/16-20	1.0925NS	17.50
1 1/16-32	1.1047NS	22.94
1 1/8-12	1.1334NS	20.11
1 1/8-18	1.1514NS	19.28
1 1/4-18	1.2139NS	21.26
1 5/16-12	1.5709NS	25.11
1 11-12	1.6334NS	24.89
1 11-32	1.6672NS	35.85
1 3/4-12	1.6959NS	28.72
2-24	1.9729NS	34.97
2.123-32	2.1027NS	63.45
2 1/4-18	2.0889NS	38.07
2 1/4-32	2.1047NS	52.73
2 1/2-14	2.4536NS	43.24

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5/16-18	.2752NS	10.80
5/16-32	.2898NS	11.25
.391-32	.3707NS	15.79
.391-32	.3681NS	16.70
1/2-13	.4463NC	12.24
1/2-28	.4757	17.75
1/2-32	.4786	17.34
5/8-12	.5044NC	13.50
5/8-24	.5324NS	15.43
5/8-24	.5342	19.31
5/8-24	LH	19.31
5/8-11	.5601NC	13.50
5/8-16	.5812NS	12.21
5/8-20	.5895NS	13.40
3/4-24	.7199NS	16.49
11-10	.7422NS	15.68
11-36	.7912NS	22.94
7/8-9	.7958	16.20
7/8-12	.8169NS	16.04
7/8-16	.8308NS	16.06
7/8-20	.8389NS	14.47
7/8-20	.8410	20.01
1-12	.9419NS	17.56
1-16	.9558NS	17.37
1-20	.9639NS	17.58
1-24	.9694NS	19.70
1 1/16-20	1.0260NS	18.18
1 1/8-12	1.0669NF	20.25
1 1/8-18	1.0849NS	17.84
1 1/8-20	1.0885NS	17.20
1 1/4-18	1.2099NS	20.89
1 1/2-18	1.4599NS	22.92
1 11-12	1.6286NS	28.22
1 11-32	1.6630NS	37.52
1 3/4-12	1.6911NS	27.96
1 3/4-32	1.7255NS	39.22
2-24	1.9685NS	37.64
2.075-32	2.0499NS	55.81
2.123-32	2.0979NS	53.78
2 1/2-14	2.4483NS	40.92
2 1/2-24	2.4679NS	51.04
3/4-36	.7290	20.84
1 1/8-12	1.7536	29.52

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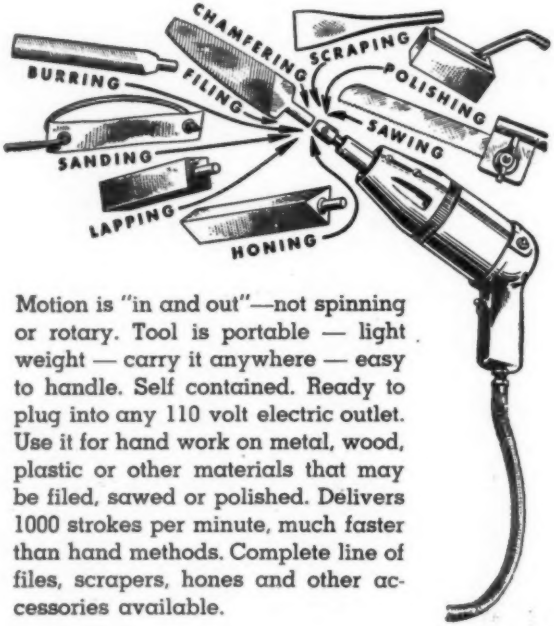
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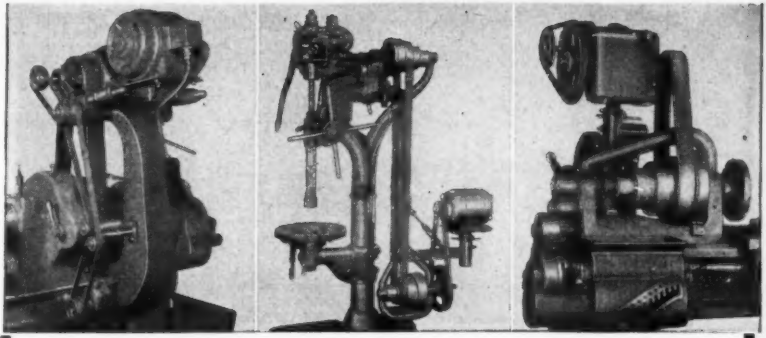
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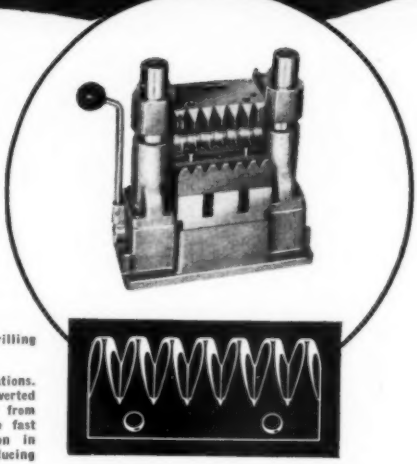
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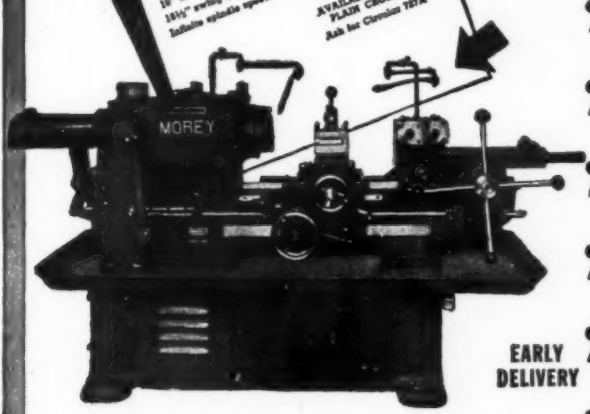
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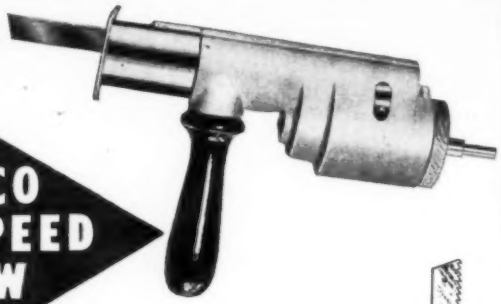
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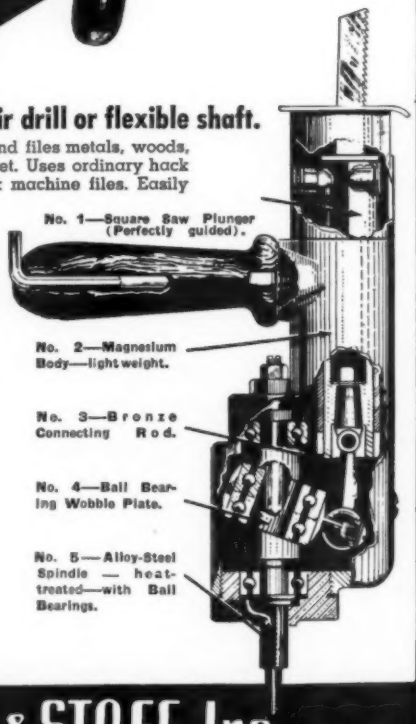
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The Engineering of Manual Marking Devices

By C. O. MALMSTROM*

DURING recent years, new designs of industrial products, changing production techniques, and new materials have been and still are—creating problems which call for new types of manual marking devices for various identification and inspection purposes. In addition, marking of parts in production has graduated to a position of importance warranting the application of tool engineering principles to their design and use. As a result, many variations in design of simple hand stamps as well as numerous new types of marking devices have been developed to meet specific process requirements. Many of these devices in turn have become new "standards" since their usefulness has been considerably enlarged by virtue of their improved designs.

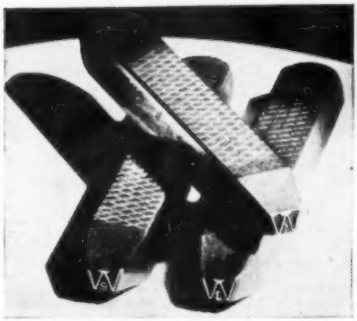


Fig. 1—Hand stamps with "round" faces rather than "sharp" faces for the low stress marking of lightweight alloy forgings and castings.

Typical among numerous recent developments designed to answer specific marking problems have been:—(1) the simplification and speeding-up of inspection and salvage work; (2) devices for lower cost annular marking of large quantities of bushings, sleeves, etc., with identical series of numbers; (3) marking devices which materially lessen the chances of cracks starting in highly stressed alloy parts which are marked with hand stamps.

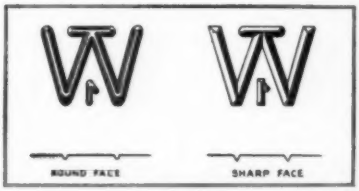


Fig. 2—Both faces and impressions are rounded on these new stamps. Rounding faces of the characters has much the same effect as the use of a fillet rather than a sharp corner.

This latter instance—the problem of marking the "soft" lightweight alloy forgings and castings which will be subjected to comparatively high tensile and torsional stresses in service—is an excellent example of how proper engineering of the hand stamp's design can solve an otherwise potentially serious problem.

It has been demonstrated both in the laboratory and in the field that no part which is expected to stand up under repeated loads over an indefinite period of time without fatigue or failure can be allowed to have any surface imperfections such as the indentations caused by **sharp** number stamps. If such imper-

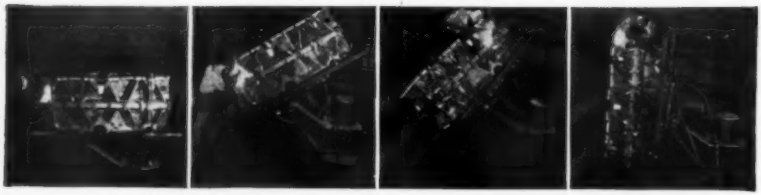
*New Method Steel Stamps, Inc., Detroit, Mich.

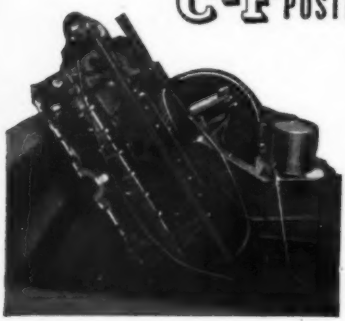


Fig. 3—New types of inspectors' stamps are numbered from 1 to 99. The numbers in each group are enclosed in a border, shaped for easy identification.

fections are located at a section subjected to high tensile or torsional stresses, the imperfection will increase that stress to the point of initiating a tear or a crack which will gradually but surely progress until a complete failure occurs. However, since it was imperative—due to tremendously increased production schedules—to mark lightweight alloy airplane parts by means of fast, economical hand stamps, such stamps have been re-designed to meet this specific case.

These "Round Face" stamps, as they are called, have both face and impression





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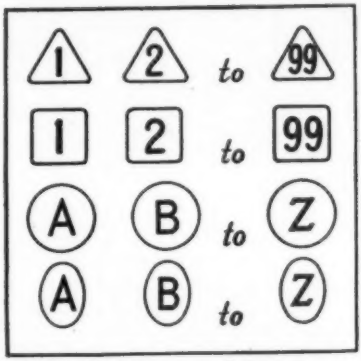


Fig. 4—Various types of borders are available on the new inspectors' stamps —squares, triangles, circles, ovals, etc.

rounded rather than **sharp**, as in the conventional stamp (see Figs. 1 and 2). It has been found that the use of such round face stamps materially lessens the chances of cracks starting in the lightweight metal forgings and castings so marked. In this respect, the rounding of the stamping characters has much the same effect, as compared with conventional sharp face stamps, as is obtained by the use of a fillet rather than a sharp corner. These round face stamps for "low stress" marking are now being produced in accordance with SAE aeronautical specifications which call for impressions not deeper than .003" and fillets (radius of curve) of not less than .006" at all intersecting surfaces of an impression.

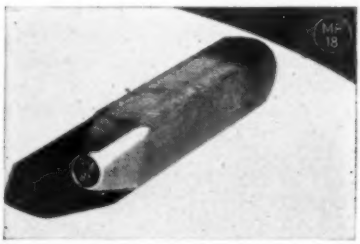


Fig. 5—An inspectors' stamp has been specifically designed for Magnaflux operators. The border may be circular, oval, square, triangular, etc.



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The growth of multi-shift operations in industry even prior to the inception of the war production program brought in its wake a definite need for a new design of inspectors' stamps to facilitate identification of parts. One way in which this problem has been met is illustrated in Figs. 3 and 4. Introduced some time ago by New Method, it is now widely used thruout industry in various forms, sizes and modifications.

Instead of requiring a variety of designs to identify individual inspectors or operators as is done with "conventional" inspectors' stamps, the new stamps are numbered from 1 to 99. The numbers in each group are enclosed in identifying shaped borders (see Fig. 4). Thus, one group may have the number enclosed in a square, another in a triangle, another in a circle, and still another—if needed—in an oval.

This design made it possible to assign identical numbers with different borders to inspectors or operators doing identical work. It permits quick identification of

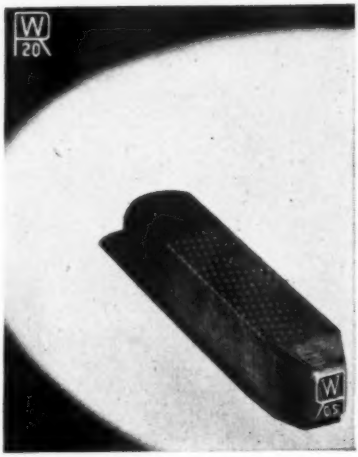
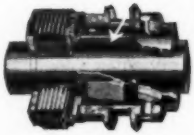


Fig. 6—New design of "letter outline" stamp which may be used to show that a part from supplier "R" was welded by certified welding operator No. 20.

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the inspector who passed the part, and also may distinguish work done by night shift from that done on the day shift.

The use of Magnaflux inspection equipment is typical of inspection operations which increased tremendously during the war. For such specialized inspections, it has been found desirable to use a special design of inspectors' stamps. As illustrated in Fig. 5, the inspection stamp engineered for Magnaflux work is similar to the simplified inspectors' stamps described. A departure in design is the incorporation of the letters "MF" together with the numeral or letter within a specially shaped border. This border may be of a large variety of shapes:—circular, oval, square, triangular, etc.

The important feature of this design is that it not only indicates at a glance whether or not a part has been tested by the Magnaflux method, but also permits ready identification of the particular operator who has passed the part thru the Magnaflux operation. No other operator is permitted to use the same stamp.

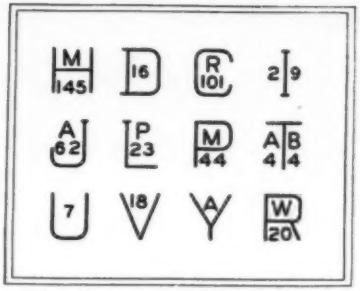


Fig. 7—Using large letters for outlines on hand stamps permits an almost unlimited number of variations in design with quick identification, increase in amount of information conveyed, and maximum legibility.

Another widespread practice whereby a number of sub-contractors all made the same part and shipped them into the contractor's plant in quantities, brought with it a need for hand stamps which would convey more information at a single glance than is usual with stamps

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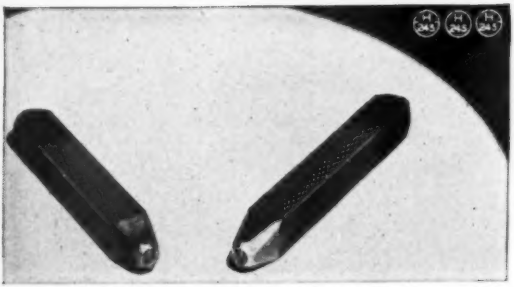


Fig. 8—Identification stamps designed specifically to simplify inspection and salvage work. Material which is OK can be marked with the stamp without bars; material to be salvaged is marked with the one bar stamp; while material to be scrapped is marked with the two bar stamp.

of ordinary design. One way in which this problem was solved was with the "Letter Outline" stamps shown in Fig. 6. By means of manual marking devices such as these, it is a simple matter to identify the company supplying the parts; also any individual operator who may have performed machining, welding, etc., operations on the part, and the particular inspector responsible for O.K.'ing the parts—all from a single impression of the stamp.

In this new hand stamp design, a large initial letter is utilized as an outline on the stamp. Other pertinent information—as to operator and the particular operation which he performed on the part—is all included **inside** of that character outline. For instance, the border of the typical stamp shown in Fig. 6 is formed by the letter "R" which may be used to designate the manufacturer. The letter "W" appearing in the upper loop of the "R" may signify that the partic-

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ular assembly bearing this marking was "welded" by "certified welder No. 20", in addition to having been supplied by contractor "R".

The flexibility of this basic design permits thousands of variations to meet the needs of modern industry (see Fig. 7).

In much the same manner, by means of incorporating other minor but instantaneously identifiable variations in designs of series of inspectors' stamps—this time in the form of short bars on one or both

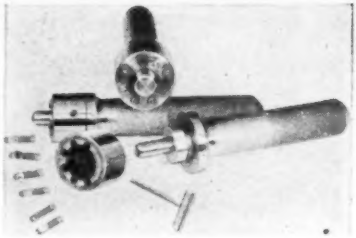


Fig. 9—A newly designed stamp holding device for annular marking, using the same size of type blanks and characters for all small or large flat radii being marked.

sides of the numerals, letters, or other characters—a hand stamp has been devised which is doing much to speed up and simplify the work of inspection and salvage. Fig. 8 shows a typical set of such stamps which can be used by the same inspector to give various instructions.

The stamps shown here are identical

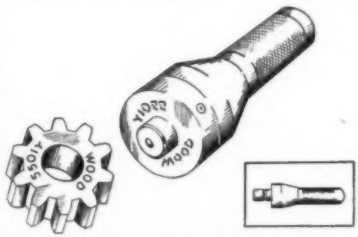


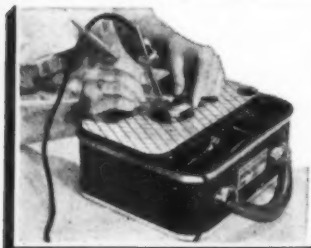
Fig. 10—This annular marker is especially useful for marking large quantities of parts with identical series of numbers.

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excépt that one of them has **no** bars; one, a short bar on the **right** side; and the other, a bar on **both** sides of the impression. When in use, it is customary to employ the stamp bearing **no** bars for marking material which is O.K. Parts to be salvaged are usually marked with the **one** bar stamp; then, when re-worked

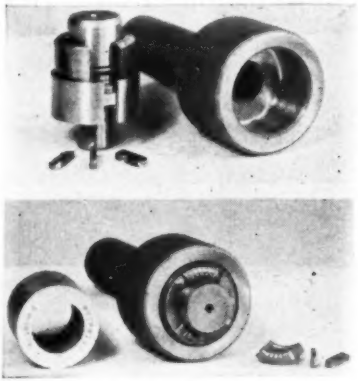


Fig. 11—A pilot holder for annular marking designed to require no set screws for holding type in place.

and passed by the inspectors, stamped with the **no** bar, or O.K., marker. Material to be scrapped, of course, is marked with the **two** bar stamp. Thus, every part turned out under this simple marking system carries a complete history of its inspection and salvage operations in readily identifiable form.

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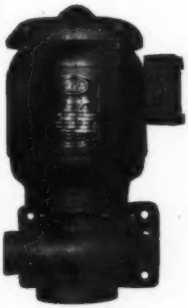
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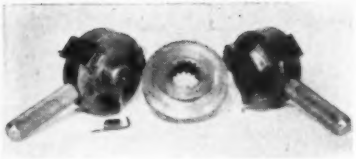


Fig. 12—A pilot marker for annular marking which allows selective marking of parts without changing either type or retainer.

cial stamp holders—has come to be so much a part of regular production procedure that time of marking and also the time required to set up the holding device has become important. It may sound somewhat unusual to speak of the "set-up" time for a marking device, yet it is possible—thru proper engineering and design—to materially lower costs of marking of parts. The time saved in the manipulation of one holding device for manual stamping—when multiplied by the frequency with which it is used and the number of times it is employed on one operation—add up to a respectable total.

A recent example of engineering a stamp holder for the purpose of reducing its set-up time is illustrated in Fig. 9. This holder, of course, is specifically designed for the fast, accurate annular marking of heat treat codes, dates, num-

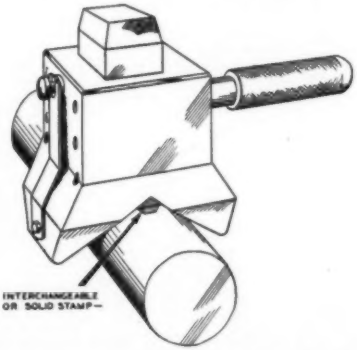
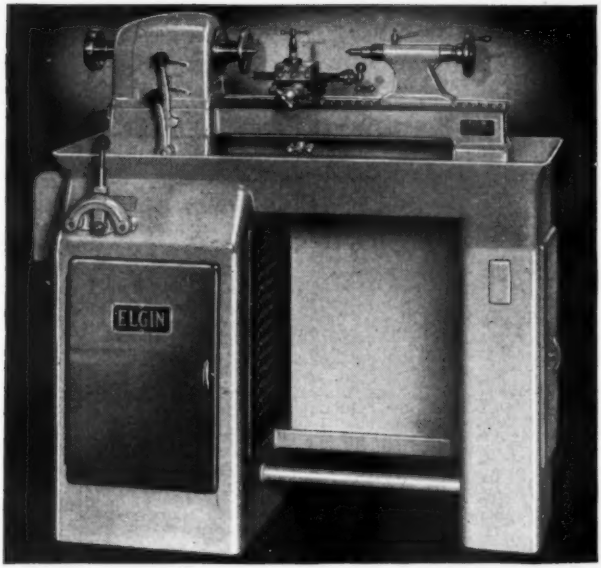


Fig. 13—A round shaft marker which automatically centers stamps on the OD of the round bar being marked.



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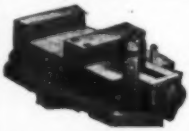
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bers, etc., on bushings, gears, sleeves, and other similar parts. The ordinary annular marker employing removable type necessitates a change in size of type blanks and characters for marking small and large flat radii. This new design, however, uses the same size type for any size radius, and also eliminates need of spacers inserted between individual type characters.

A feature of this particular annular marker design makes the device especially effective for stamping dates on metal parts if a single character can be removed without disturbing the rest of the type. Thus, when the date changes, a single number can be changed quickly.

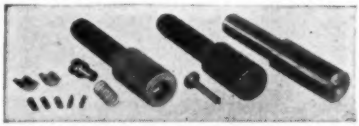


Fig. 14—A type holder especially designed for marking shaft ends or other solid stock around a center hole.

As shown, the locking device above the pilot of the type holder on this annular marker has a flat ground on its circumference. The type retainer—drilled to accommodate the desired number of type characters—carries indexing marks facilitating the loading and unloading of steel type. When changing a character, the corresponding index mark on the type retainer is registered with the zero mark on the anvil, allowing the character to drop out of the drilled hole and another

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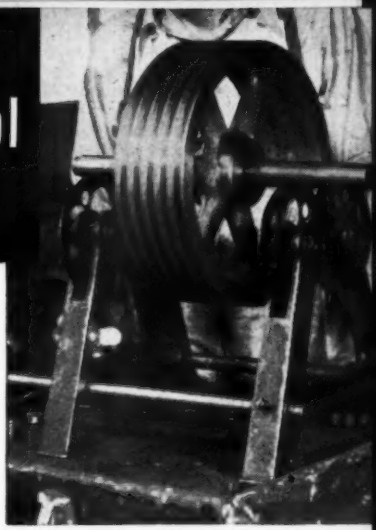
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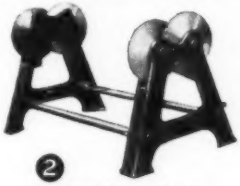
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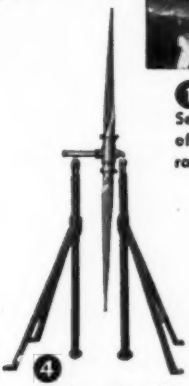
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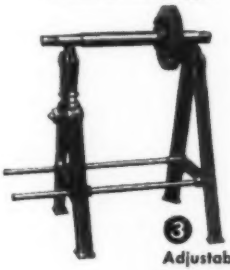
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one to be inserted. This is accomplished by flats on the round shanks of the steel type mating with the flat on the locking device. When the indexing mark on the anvil coincides with the mark at the tapped hole in the type retainer, the entire assembly can be locked into place with a single set screw, still another advantage over the conventional design wherein each character requires its own separate set screw.

Another idea in annular marking devices—this one designed particularly for stamping numbers and characters uniformly around the circumference of round holes where there are large quantities of parts to be stamped with **identical** series of numbers—is shown in Fig. 10. This holding device consists of a pilot holder and a removable bushing, or solid marking die. The solid marking die is retained on the holder by means of two set screws which fit into a groove machined into the pilot (refer to Fig. 10). The set screws are so arranged that all hammering strains are transmitted to the shoulder of the guide. Different marking dies, of course, are used for different series of numbers or characters.

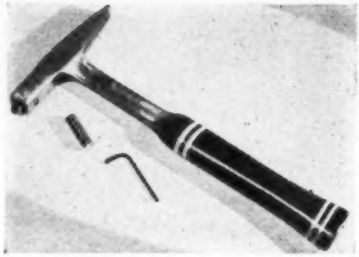


Fig. 15—Another type of holding device which eliminates use of fingers for positioning individual hand stamps.

Still further variations in the design of stamp holders for annular marking are shown in Figs. 11 and 12. Fig. 11 illustrates a pilot holder which requires no set screws at all. Retaining action of the removable type is here provided by

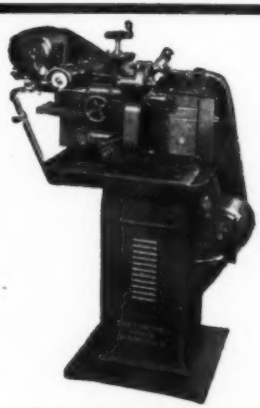
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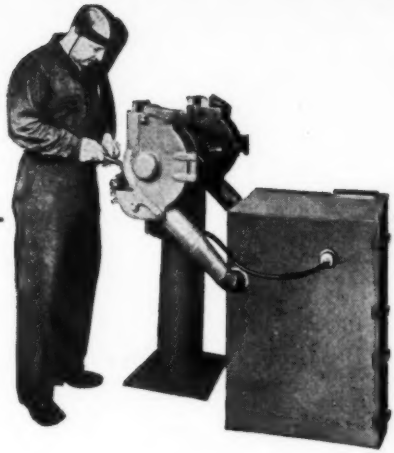
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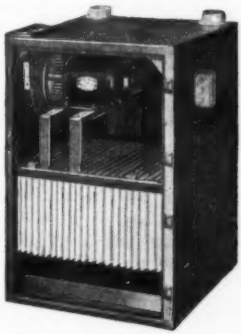


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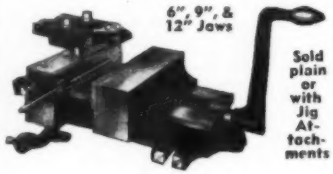
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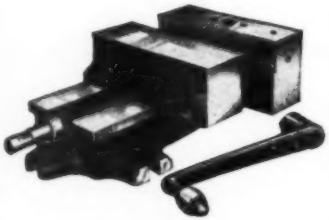
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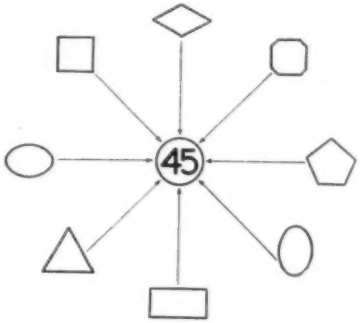
With insertable special jaws, plus stops, guides, drill guide plates, etc., this vise serves as a jig or fixture for all sorts of shapes on drill press, radial, miller, planer, shaper, grinder. Ideal for repeat-operation work. Flush, parallel, square construction aids accurate positioning. Sizes up to 124 lbs.

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the ring and sleeve locking action. This compact design also permits using the maximum number of characters. The marker pictured in Fig. 12—also for annular stamping—allows the selective marking of round parts without changing either the type or the retainer. In addition, either one, two, or three sets of characters can be stamped with this device.



Typical stock border designs, enclosing numbers 1 to 99, for steel stamps with which up to some 2500 operators can be identified in a single plant.

One awkward task which bothered shop men for years was the manual stamping of round bar stock on its OD. The difficulty, of course, was that the hand stamps would tend to slip when held in the fingers and struck with a hammer, marring the bar, resulting in skinned knuckles, and wasting time retrieving the hand stamp which sometimes flew off into some inaccessible corner of the shop.

To overcome this, a simple centering device for marking round bars was designed. This round shaft marker (Fig. 13) consists of a vee block which holds the actual stamp or stamps. This device, of course, may be used with either solid or interchangeable type. The vee block also automatically centers the stamps on the OD of the bar being marked so that all numbers will be stamped in line in proper sequence and with equal depth and clarity.

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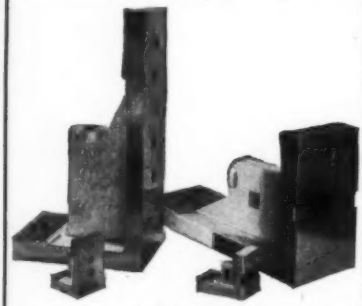
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On this particular round bar marker, a knurled stud — held tightly by a flat spring—fits into a slot machined in the shank of the solid stamp or type holder. In this manner, the stamp possesses the necessary amount of vertical play, but is kept firmly in line in all other directions since the shank is finished to a smooth sliding fit in the holder. A knurled handle permits the entire shaft marker to be held firmly in place on the bar stock while actual stamping is being done.



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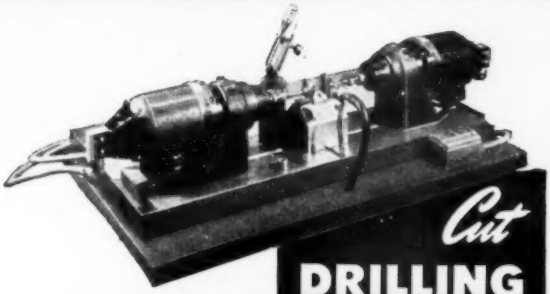
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To mark ends of round bars or shafts concentrically, a steel type holder has been designed which may be used with either individual type or with logotypes made to the user's specifications. This holder (Fig. 14) is equipped with a floating locating pin backed up by a light spring to insure proper register of the markings around the center and prevent slipping. Individual steel type or logotypes are made in tapered segments to form the required radii. The segments are held firmly in position by set screws and a heat treated spring sleeve, bottoming against a hardened and ground anvil. Blank spacers are used to fill the space between type segments, if needed. When used for hand marking, the shank is knurled; if the device is to be mounted and used in a press, the shank is turned.

Another time saving safety holding device which eliminates need of holding the individual hand stamps while marking parts is shown in Fig. 15. This is an all-steel "inspectors" hammer with the shank forged integrally with the head and extending thru the handle, which is of heavily lacquered compressed rawhide. Face of the hammer head is drilled to receive round stamps of varying diameters. The stamp proper is held in place by a standard size flush-type set screw. With this hammer, clean, sharp impressions can be stamped into hardened steel parts at a single blow without danger of damaged knuckles or stamps slipping and flying across the shop.

These devices are typical of the job of tool engineering done on marking devices in recent years.





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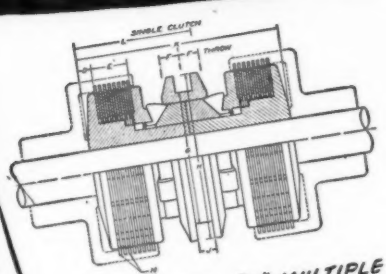


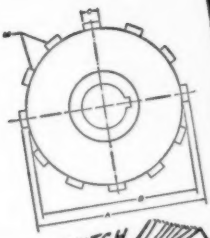
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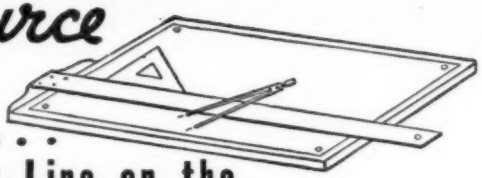
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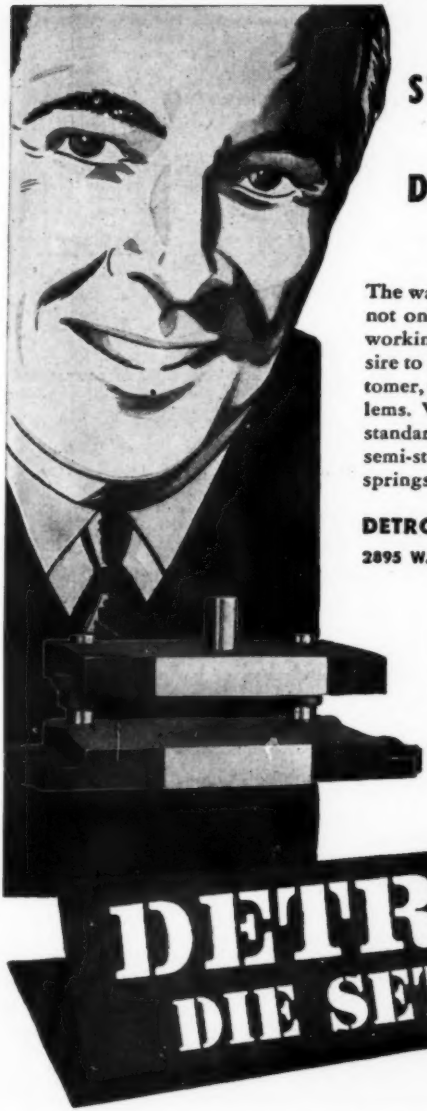
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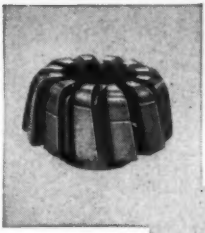
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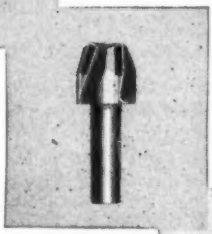
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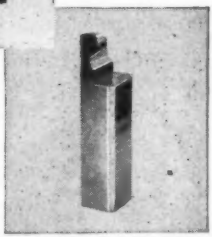
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THE FOREMANSHIP FORUM

By Edmund Mottershead

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While reconversion has been delayed in some lines for various reasons, it is common sense to look ahead, both for our own security and for the security of the jobs of the men in our departments, in our companies. The number of jobs in a company will depend directly upon the number of sales a company can make. Many people, thru war bonds and other savings have accumulated a sizable amount of extra money during the war. Every indication points to a very great purchasing power available during the years just ahead—purchasing power for automobiles and refrigerators, more shoes, more wool clothing, more nylon hose, more of everything, and especially the things which have either been curtailed or not produced at all during the war.

However, if prices are too high, even with substantial savings on which to draw, the average customer will simply have to cut down on the things he buys. American industry will face the competition of our own manufacturers, and also the competition of foreign

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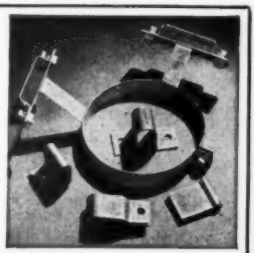
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manufacturers who are getting back on their feet. Many of these foreign manufacturers, indeed, will have such subsidies and support of special kinds from their own governments as to sharpen their competition with our own independent industries.

Only if we can keep our costs in line can we successfully meet the competition of our own companies and of foreign manufacturers. And keeping costs in line for the future cannot mean lower wages or lower quality products. The reduction in manufacturing costs will have to come from greater individual worker efficiency and productivity, from better methods, from maximum utilization of machines and time, from cutting waste of materials to the bone.

There are plenty of illustrations of what has happened under the pressure of war contracts and what can be done to reduce costs and increase production at the same time. One steel fabricating plant operating under war contracts had so suddenly boosted its volume of production that the plant was operating far beyond its normal capacity. Like everyone else, the management was faced with a shortage of skilled workers, shortages of critical raw materials, lack of space; lack of essential tools and equipment. The only solution, as in most industry today, was better all-around performance in every phase of the manufacturing process—accomplishing more with less.

A survey of the plant's operations disclosed several things. The purchase and delivery of raw materials were not properly coordinated with production and delivery requirements. There was a lack of uniformity in the fabricating methods used. Excess handling and rehandling of parts and materials wasted much time and effort. Production was tied up in bottlenecks created at strategic assembly points. Production schedules were inadequate, so that certain parts were overproduced and others continually running short. Tool breakage and tool repairs were running away out of line. Labor and material costs were unnecessarily high. Bottlenecks within departments existed due to failure of other operating points to

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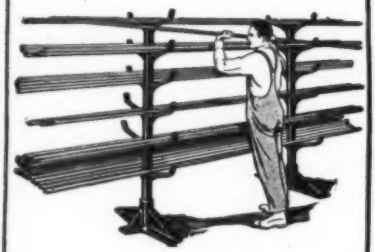
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meet delivery schedules within the plant. There was considerable waste in labor productivity due to a lack of adequate worker incentives.

To correct these conditions and increase production while reducing costs, industrial engineers developed this program:—A complete planning and scheduling system, progressively routed production thruout the plant; complete materials control so that raw materials and production needs coordinated; wage incentive system; tool control system; revised plant layout; better handling and loading methods; manualized all factory operations with individual detailed instructions for workers and supervisory personnel at various echelons of responsibility and authority. The results: — earnings of labor increased about 20 per cent, while 50 per cent increase in production was accomplished without any delay for additional equipment or other facilities.

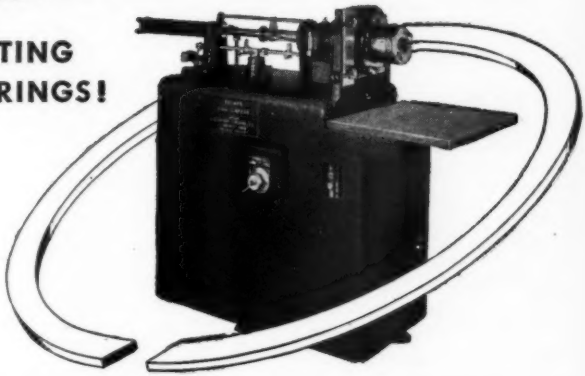
There are two ways of looking at the problem of costs:—looking for remedial action which may be taken for an existing situation, and planning in advance for an entirely new operation.

Foremen are in close contact with all phases of shop costs. Naturally, they are chiefly interested in materials and men, but the items of repair and supply costs and other kinds of expense are under their direction. It is essential that they pay adequate attention to these more indirect items of production cost.

If a business is small, and the manager is frequently in the shop, he learns about many things thru every day contact. However, as time goes on, he has to depend on reports for his guidance, as he cannot carry all the details in his head. He must have reliable reports of cost which will enable him to determine where improvements may be made and also to establish selling prices that will meet competition and still return sufficient profit to keep the plant in operation. Reliable cost data must be available and must be used intelligently. Record keeping to

Eliminate Guesswork

IN FITTING PISTON RINGS!



FULMER PISTON RING LAPPER

Only 10 to 25 strokes of the Fulmer Piston Ring Lapper will assure 100% contact of piston rings with the cylinder walls! There is no guesswork as to how rings fit the cylinders—you can see that they have a perfect bearing, *before the engine is built up!*

The Fulmer Piston Ring Lapper reduces "run-in" time from many hours to just a few minutes. It eliminates the need of tearing down engines because rings do not "seat" properly. It assures peak performance from engines, pumps and compressors, with longer operating life between overhauls. *Write Today for Complete Information.*

C. ALLEN FULMER COMPANY

1242 First National Bank Bldg., Cincinnati 2, Ohio

FULMER PRECISION PRODUCTION EQUIPMENT

ROD BORERS
HONING MACHINES
PISTON RING LAPPERS
CENTRIFUGAL CASTING MACHINES

DEALERS: *A few attractive territories remain open. Write today!*

POWER FEED
For Facing

BORING, TURNING, FACING, UNDERCUTTING COMBINED IN ONE TOOL HEAD

The power feed feature for facing operations insures smooth, uniform movement of tool across work surface. This power feed can be engaged or disengaged instantly. Adjustment of tool for boring is obtained in increments of 1/10,000 in direct reading.



All Operations In One Set-Up

Pat. No. 2,356,651

For Jig Borer, Drill Press, Milling Machine

Cutting bar can be set to any position in Tee slot of slide. Hardened and ground throughout. Feed screw and worm ground from solid. Gears and feed nut phosphor bronze. Head 3" dia. x 4" long. Wt. 9 lb. Any type shank furnished. Write for complete information.

CHANDLER TOOL CO.
514 OHIO AVE., MUNCIE, IND.

CHANDLER DUPLEX
BORING AND FACING TOOL HEAD

provide this data is an important and productive work.

Cost clerks use reports furnished by foremen and work out the results in terms of dollars and cents. These fellow workers should work to close limits in order to show as nearly as possible the actual cost of goods produced. Reliable records are necessary for management as well as for foremen. An adequate cost system provides for the accounting of all money spent. One that does not do so is dangerous and can easily lead management into ruinous competition.

In any cost system, the basic elements are the same:—direct labor, direct materials, and administrative expense or overhead.

Direct labor is that which is required to machine and finish an article and it is usually practical to include inspection, packaging, and other jobs as direct labor if the time consumed or quantity handled can be reported conveniently and broken down with reference to the units produced. Otherwise these items are carried as overhead. Direct material is that which is required in the manufacture of the article itself.

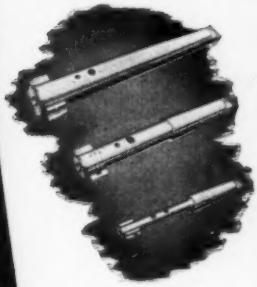
Administrative expense or overhead includes all other outlay and is commonly classified by groups:

1—Departmental Expense. This includes the wages of all indirect shop workers, cost of departmental supplies, small and perishable tools, repairs to machinery, buildings, power, light, heat, fuel, and when practicable in the particular case also includes taxes, depreciation, insurance and other items of expense for which each department may be held directly responsible.

2—General Shop Expense. This includes the cost of items that cannot be charged specifically to each department, such as the wages of the shop superintendent, stock room help and others who serve the shop as a whole. Sometimes the cost of drawings, patterns, and tools are included.

4 REASONS WHY MADISON REAMERS CUT TIME AND COSTS

The simplified design and operational features of Madison Production Reaming Tools will enable you to cut your reaming time and hole costs to the minimum. Easy to adjust, to maintain and always aligned, the free, smooth cutting action of Madison Reamers has provided the answer to industry's need for greater speed and economy in reaming operations. Check the four reasons for Madison efficiency listed below.





MIRROR-SMOOTH FINISH

The cutting blades of a Madison Reamer produce a mirror-like finish that in most cases does not require an additional finishing operation. Since Madison cutters are pre-sized, any number may be stored in a crib. The Madison one-screw adjustment feature insures that both blades always cut, by eliminating possibility of unequal cutter blade expansion.



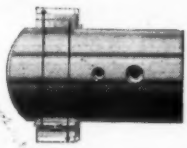
BETTER CHIP CLEARANCE

Because Madison Reamers have no multiple inserted blades, there is more room for chip clearance and circulation of coolant. Thus, danger of clogging and resultant overheating is eliminated, and shrinking or tapering of the hole prevented. Further insurance against hole distortion is provided by Madison's freer cutting action, which permits work to be held very lightly. This makes Madison Reamers ideally suited to the machining of the new, lightweight metals.



INTERCHANGEABILITY

Since Madison cutters are pre-sized, they are interchangeable in Madison bars. A sharp cutter can be inserted in a Madison bar in a matter of seconds without disturbing the original set-up. Keeping a sharp cutter in operation at all times assures more continuously uniform work and the holding of required tolerances. The two-bladed Madison cutter will naturally require less maintenance time.



CONTROLLED FLOAT

Because the Madison cutter is floated in its bar at the exact point where the cutting action takes place, float can be better controlled and indicated for greater uniformity on long-time production jobs. Chances for bell mouth and bar wobbling are eliminated. No special floating tool holders and chucks are necessary.

MADISON
MANUFACTURING COMPANY
DEPT. B-4 MUSKEGON, MICHIGAN

Madisons are used for rigid or float reaming on lathes, drills, millers and special machines. Used on hard and soft metals and plastics. Write for the Madison catalog — lists complete lines, prices and grinding instructions.



3—Selling Expense. This includes the salaries of salesmen and their travel and other expenses, as well as the salaries of the sales department clerks and other personnel. Advertising, catalogs, and all expenses incurred for the purpose of selling or promotion of the product are included also.

4—Administrative Expense. This includes the salaries of top management and all other expenses that cannot be grouped with either the shop or sales department expense accounts, and also includes such general expenses as telephone, postage, legal fees, donations, and other items incurred in running the business.

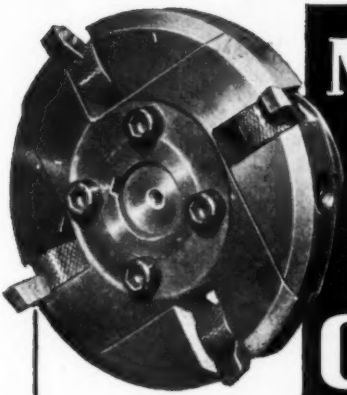
Several accounts are usually maintained for the purpose of separating the values of raw material as:—castings, steel, lumber, and stores. These are inventory accounts and are charged with all purchases and credited as the materials are drawn out and used. It is customary to have one account that consists of the charges that accumulate while the product is in process of manufacture . . . such as "Work in Process", and charges are made from the labor tickets and materials requisitions and may or may not include shop or departmental expense, depending entirely upon the nature of the business and the policies of the management.

There are three outstanding plans by which the cost data are assembled and developed into cost of production:

1—Job Order Costs. Under this plan, manufacturing orders are issued for each lot of stock that is to be made up. Direct labor, material required, and expense frequently are charged to the order number, and when the job is finished the charges are totalled and the unit cost obtained.

2—Process System. This system can be used successfully where the unit of output is in tons, gallons, yards, or some other quantitative bulk measure. The production units are divided into direct labor, direct expense, and ma-





NEW-FIELD *Universal* FLY CUTTER

MAKE 4 TO 6 CUTS WITH DIFFERENT STANDARD BITS *IN ONE OPERATION!*

Using any type high-speed steel or carbide bit, the NEW-FIELD UNIVERSAL FLY CUTTER can be used for multiple cuts in one operation! This new type fly cutter eliminates any need for special cutters for each different milling operation.

Here's another New-Field economy feature: bits can be repaired, resharpened or reground for a new milling operation in your own shop! NEW-FIELD UNIVERSAL FLY CUTTERS save hours of down-time!

To boost production ... cut costs ... write today for full information about the NEW-FIELD UNIVERSAL FLY CUTTER ... or send a wire.

A FLY CUTTER THAT CAN BE USED FOR FLAT SURFACES ... STRADDLE MILLING ... SLOT CUTTING ... IDEAL FOR MACHINING PLASTICS!

Versatile! *New!*

NEW-FIELD MACHINED PARTS CO.

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Export Division ... 80 Broad St., New York • Distributors throughout U.S.A. and Canada

UNIVERSAL BORING BAR HOLDERS

The O. W. Center Scope



If it were possible for you to look straight down thru the center of your spindle shaft — you would see the job exactly as you see it thru the

CENTER ⊕ SCOPE

A *NEW* LOCATING TOOL

The O. W. Center Scope is an optical centering and locating tool that can be easily used on any machine to center work reference lines to a spindle center line with simplicity, speed and accuracy. Write for further information on this or other Center Scope products.

WRITE FOR FURTHER INFORMATION

CENTER SCOPE PRODUCTS
3829 San Fernando Road
Glendale 4, California

terials, and give specific costs per unit for the various elements.

3—Standard Cost System. This is perhaps the latest form of cost system and has gained favor in many industries. Cost is calculated and accepted as normal either from past records or from time study. Goods produced are debited and credited to the book accounts at this cost. Variations either way from the actual cost in subsequent production are debited or credited to a separate account set up for the purpose, and the balance of the account disposed of thru the Profit and Loss Account. Whenever changed conditions bring about a definitely higher or definitely lower normal cost, new cost standards are set.

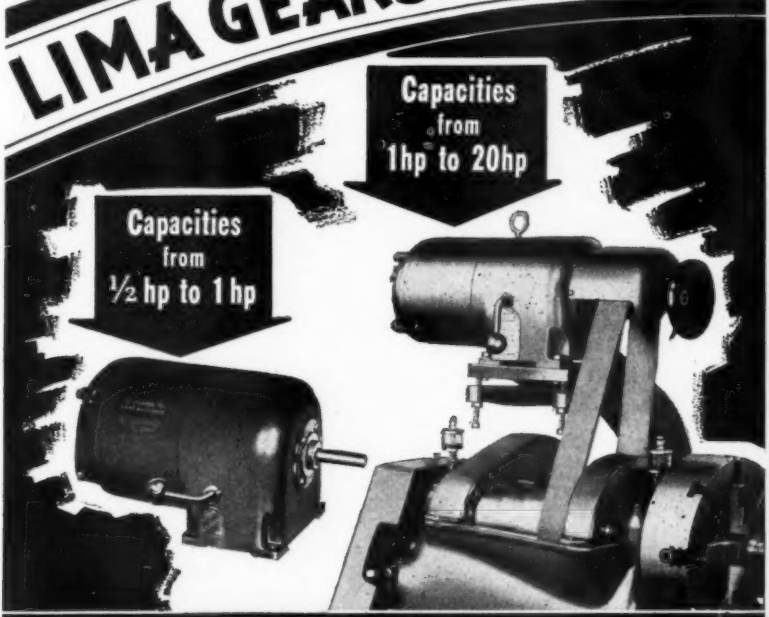
These considerations have been mentioned, not so much as a detailed examination into cost accounting, as to bring into sharper focus some of the essential factors in reducing costs in manufacturing industries. The time to start reducing costs is right now!

Management Information — published by the Elliott Service Co., recently gave an interesting story on this point. The general manager of a certain concern called a meeting of all supervisors to tell them something about company plans. Cutbacks in war orders had given the company an opportunity to resume some civilian production. "The prospects are that we will be increasing our civilian production at a fairly rapid rate from now on", the general manager told his men. "A number of other companies in our industry are in the same position and they too are getting busy on some civilian work. Also there are a few companies who did not get into government work very strong who have been picking up customers we used to have. It means that we are going to have to tighten our belts and fight for every bit of business we get.

"This means that we must depend on you supervisors to do a close cost control job in your own departments. You are the part of management located right

A QUALITY NAME TO *Remember* WHEN MOTORIZING MACHINE TOOLS

LIMA GEARSHIFT DRIVES



THE LIMA ELECTRIC MOTOR CO.

220 FINDLAY ROAD

LIMA, OHIO

REPRESENTATION IN MOST PRINCIPAL CITIES

LIMA GEARSHIFT DRIVES

LIMA PEDESTAL GRINDERS - LIMA ELECTRIC MOTORS



CUTS METAL FASTER

More Accurately

If you require accurate, high-speed cutting of non-ferrous metals and other materials, here is your machine. Cuts by smooth, fast, milling action. Pneumatic hydraulic feed is coordinated with speed of cutting blade. Vise synchronized with action of ram. No vibration because of weight distribution. Has 4 speed transmission and variable feed mechanism. Built-in coolant system. Properly operated, blade breakage is eliminated. Write or wire for free literature.

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2031 SANTA FE AVE., LOS ANGELES, 21, CALIF.

COMET
AUTOMATIC CUT-OFF MACHINE
MODEL MH

at the point where the actual work is being done. I'm not going to tell each one of you just how to trim costs in your own department. I've told you how important it is, and I am going to be very interested in watching how each of you tackle the problem in your own department."

After hearing the general manager's remarks, Ed Donovan decided that if he was going to get cost results in his department, he would have to get them thru his men. Whatever the results were would depend upon the individual men doing the work. He tackled the problem in this way:—He planned his work so that every day he could spend an hour or so having very personal talks with individual workers. He would call one of the men into his office. First he would tell the men what the general manager had told the foremen. He gave the worker all the facts he could as to the company's situation in relationship to competing companies. He told him what he could about company plans for meeting this competition. He also reminded the workers that the future of the jobs of every one in the company depended upon whether the company's product could be made to sell in competition on the market.

Then Ed Donovan went on to point out all the ways in which the individual worker stood to gain by helping to hold costs down. He talked over the worker's job in detail, discussed the condition of the equipment, the materials he was using, any difficulties he was encountering, and got the worker to tell him what he thought he could do to keep costs down on his own job. He made it clear he was not trying to eliminate jobs by improving efficiency but to protect the jobs of all by keeping costs in line.

These personal interviews revealed a great many things. He got some excellent suggestions. He found that not only did the men respond favorably, but that many already were very cost conscious. Over a period of about three weeks Donovan carried out these interviews and covered every man in the department. He was gratified to find


Give the NELCO FIELD ENGINEER a few minutes time and SAVE hundreds of valuable PRODUCTION HOURS!
NELCO
CARBIDE TIPPED
MILLING CUTTERS
Designed for High Speed Milling
Specially developed and manufactured for machining all types of metals.
Massive design, correct grade heavy carbide tips and special high tensile cast iron alloy bodies combine to provide top performance.
The successful use of Nelco Carbide Tipped Milling Cutters lies in their correct application. In order to acquaint you with these efficient, time-saving tools, and how to get desired performance, there is a NELCO FIELD ENGINEER near you, ready to give you first hand details. IT WILL PAY YOU TO LET HIM PAY YOU A VISIT. Write for an "on the job" demonstration of these new Carbide Cutters.
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CUT COSTS

OF

Peacetime Production and Promote Precision

WITH

NICHOLSON *Expanding* MANDRELS



TYPE A—STEP JAW DESIGN: Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

Size No.	Range of Bores Taken	Length Overall
1A	½" to 1"	9"
2A	1" to 1½"	11"
3A	1½" to 2"	12¼"
4A	2" to 3"	20½"
5A	3" to 4"	21"



TYPE B — STRAIGHT JAW DESIGN: Adapted for work with both short and long bores.

Size No.	Range of Bores Taken	Length Overall
1X	½" to 13/32"	5"
2X	13/32" to 21/32"	6"
3X	21/32" to ¾"	8"
00	¾" to ⅞"	8¼"
0	⅞" to 1"	8¼"
1	1" to 1¼"	9"
2	1¼" to 1⅞"	11⅜"
3	1⅞" to 2"	13¾"
4	2" to 2½"	17¼"

(Other sizes taking up to 7" bores.)

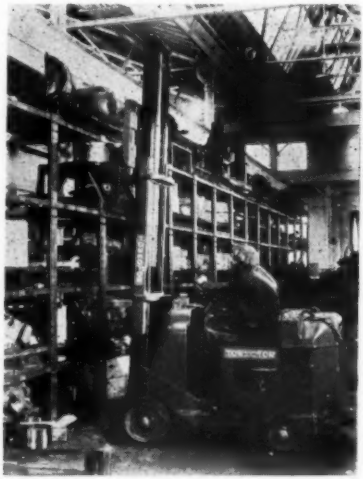
Sold singly or in sets. Prompt delivery. Bulletin 1043.

W. H. NICHOLSON & CO.

117 Oregon St., Wilkes-Barre, Pa.

that his men could be interested in the subject of costs when it was put up to them in a simple man-to-man way. He succeeded in selling the importance of low costs to his workers, and there is no question but what this approach to the problem will pay big dividends in the near future.

The time to start cost cutting is right now. If costs were permitted to get far out of line while we devoted our attention to other things, it is no easy matter to bring them back. It cannot be done overnight. The farther out of line they are, the more important it is to get them back into line. The time to start making your job as foreman secure, to protect the jobs of your workers is right now . . . by getting costs back into line with competition.



Increased wartime production demands created a serious space shortage at the plants of the Gisholt Machine Co., Madison, Wis., that was effectively solved by the use of Towmotor lift trucks. High stacking of assembly parts weighing as much as 950 pounds each provided additional overhead storage space that formerly was wasted. Gisholt also uses its Towmotors for moving materials between processes, loading and unloading a tempering furnace, for millwright work and also for moving box cars.

MASTUR PRECISION BORING HEAD

NO GIB, PERFECT ADJUSTMENT, DIRECT READING IN THOUSANDTHS, VERNIER READING IN TWO-TENTHS OF A THOUSANDTH. EVERY WORKING PART ADJUSTABLE FOR WEAR.



3 SIZES

No. 5—Boring Cap. 7"	$37.50
No. 6—Boring Cap. 11"	65.00
No. 7—Boring Cap. 15"	90.00

MORE EFFICIENT THAN ANY SIMILAR TOOL

F. A. MAXWELL CO.
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NEW PLASTIC DISCOVERY — Flex-O-Cryst — used in NUPLA Hammers is more durable than rawhide because it does not curl or deform. *Unlike rubber*, it is not affected by oil or gasoline. Will not rebound or sting. *Unlike many plastic materials*, it does not chip or crack.

That's why NUPLA Hammers are unlike any hammer you've ever seen. They hit hard effective blows without marring, cutting or battering.

NUPLA Hammer is a craftsman's tool. Has a straight grain hickory handle locked in place; finely finished. Write for name of local dealer or jobber . . . SOLD BY HARDWARE STORES EVERYWHERE.

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A NUPLA HAMMER FOR EVERY JOB
5 SIZES—29 WEIGHTS



MIGHTY *but Gentle* **NUPLA** PLASTIC HAMMERS

New HULL INDICATOR-DUPLICATING *Square*

• ***Absolute accuracy in checking squareness, steps, angles, etc., to one ten-thousanth of an inch.***



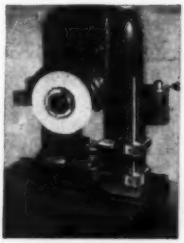
There is no guessing—no chance for error with the revolutionary new HULL INDICATOR-DUPLICATING SQUARE . . . It provides positive checking of squareness by means of a dial indicator—plus or minus—to one ten-thousanth of an inch . . . The HULL INDICATOR-DUPLICATING SQUARE is the only gage offering visual accuracy at all times—under all conditions—in checking squareness, steps, angles and other dimensions . . . Developed from years of experience in building gages and precision parts . . . Made of hardened, ground and seasoned steel—guaranteeing long trouble-free service.

For Inspection Departments—Tool and Die Rooms—Experimental Departments—Production Departments — Maintenance Departments—Machine Tool Builders—And many other precision manufacturing uses.

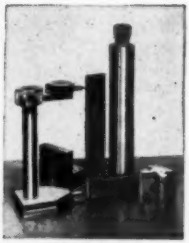
Patents Pending



18" MODEL 45A
Offsets which interfere with previous methods present no problem with the Hull Gage.



12" MODEL 45A
Used for job setup on surface grinders, boring mills, milling machines, shapers, drill presses, etc.



10" MODEL 45B
Especially useful in checking tools — showing how much off dimension—simplifying correction.

HOW TO OPERATE

1 Set gage to proper height.
2 Place contact points of the gage against master cylindrical square and set indicator dial at zero, and lock.
3 Check work by placing contact points against job.
4 Note indicator dial reading.

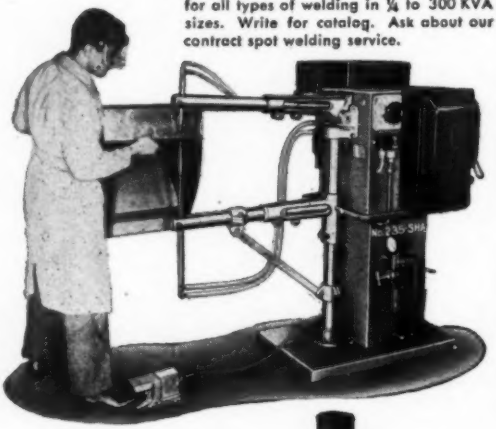
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Write for complete information and demonstration.

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Eisler resistance spot welders are available for all types of welding in ¼ to 300 KVA sizes. Write for catalog. Ask about our contract spot welding service.



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35KVA. Air operated. Slide Horn. Adjustable Arms. Weld Timer and Contractor. Excellent for universal applications.

75KVA. Multiple Press Type. Air operated. Weld Timer and Contractor.





Arc Welders
100 TO 400 AMPS.



Butt Welders



FOOT AIR MOTOR OPERATED

Spot Welders



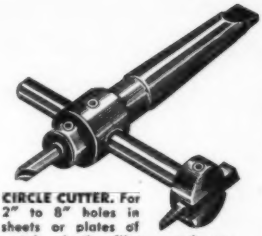
PRESS TYPE

Spot Welders
FOOT, AIR OR MOTOR OPERATED

Chas. Eisler

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CIRCLE CUTTER. For 2" to 8" holes in sheets or plates of metal, plastic, fibre, wood, etc. 1¼" pilot. ¼" x ¼" bit. Straight or taper shank.



SPINDLE STOP. Expands by collet action in ¾" headstock spindle hole. Does not scar or burr. Extension can be turned down or removed.



DIE HOLDER. Accommodates 1" and 1½" button dies. Threads can be cut to ⅜" x 3". Chases threads straight and true. No. 2 MT shank.



MULTIFACER. For counterboring seats of many diameters and contours. Made in 4 stock sizes with straight or taper shanks. Standard bits can be ground to desired shapes.

• YOU'LL BE PROUD TO OWN THESE *Tools*.

There's quality through and through these tools—fine materials, fine construction, fine finish. They belong in high-class machine shops and factories for special jobs and production runs.

Think of the work in your shop right now and you'll see where one or all of these tools would save time and simplify operations. Think of past jobs on which the Multifacer or Circle Cutter or Spindle Stop or Die Holder would have paid for itself on a single run.

We have so much faith in these tools that we'll be glad to send you any of them on approval if you write on your firm's stationery to show your responsibility. If you want to know more about them first, mail the coupon for our fully descriptive literature and prices. Do this now while it's on your mind.

ALLEN TOOL & MFG. CO.

734 Steele Ave., Dayton 10, Ohio.

Send complete information on Multifacers, Circle Cutters, Die Holders, and Spindle Stops.

_____ *Individual*

_____ *Company*

_____ *Street Address*

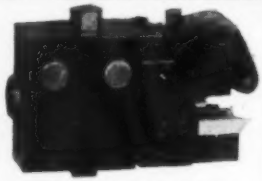
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NEW HALCO TOOLS

Now Ready . . .

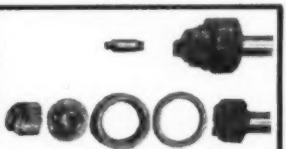


CUT COSTS! Halco Shave Tool minimizes Set-up time and Tool-adjusting time. New design features:

- ★ Roller Slide, Tool Holder Slide and Tool Head adjustable on hardened and ground dovetail ways.
- ★ Adjustable parts locked securely by set-screws.
- ★ Roller slide has micrometer adjustment graduated to .001"
- ★ Taper can be quickly adjusted from top.
- ★ All adjustments can be made from top and front of tool.
- ★ Roller is shifted to any one of three positions by removing pin.
- ★ Tool Holder Slide adjusted to center position and locked by square head screw on top, eliminating grinding the tool to a given depth or thickness.

Made in 5 sizes for all machines.

ELIMINATE Drill and Tool BREAKAGE



New-type Halco Floating Holder, available in 5 sizes, embodies Split-type Collet and eliminates conventional setscrews which can cause breakdown of drill shank and misalignment of drill and reamer with work. Holder consists of only 5 parts.

Collets in stock for all standard sizes of drills. Special sizes shipped in 24 hours.

All parts hardened and ground.



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ELECTRONIC AIR CLEANERS

By FRANCIS A. WESTBROOK, M.E.

THAT electronic air cleaning in connection with machine tool operation has arrived in force is indicated by the fact that the Pratt & Whitney Aircraft Corp. some months ago had 175 units in its East Hartford, Conn. plant and 75 in its Kansas City plant. Many other machine tool users have installations of numerous units in each plant such as Fafnir Bearing with 17; Chevrolet Motor Div., G.M.C. plant No. 2 with 24; Cleveland Twist Drill with 17; Western Automatic Screw Machine Co. with 8; Thompson Aircraft Products with 26, Westinghouse with 9, etc.

In these machine shops, the electronic air cleaners are installed to recover oil mists from coolants, to provide better housekeeping and working conditions and to salvage coolants.

Removing oil mist from the air of machine shops is important from the standpoint of lighting efficiency and maintenance. A Westinghouse unit, called the Precipitron, collected some two gallons of oil from one machine in 24 hours in a

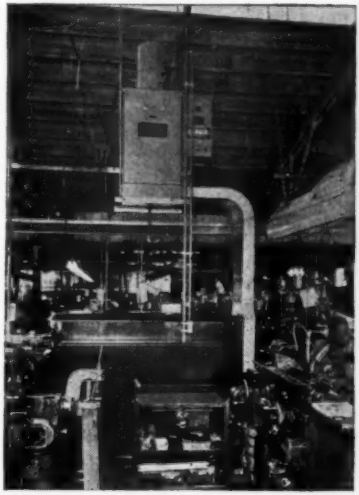


Fig. 1—Large capacity central unit to collect oil mist from a number of high speed grinders.

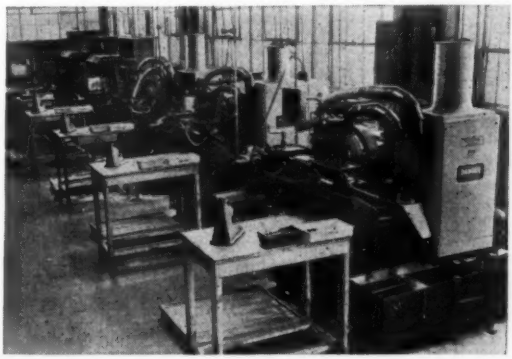


Fig. 2—A battery of machine tools equipped with Precipitron oil mist control units connected in series.

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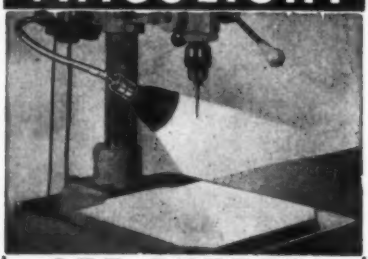
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trial installation. A substantial portion of this would have been deposited on all kinds of surfaces in the room, complicating maintenance and constituting a possible fire hazard. Moreover, the recovered oil was suitable for re-use. The control of oil haze is especially important in the windowless plant where artificial lighting is used continuously. Obviously, also, the depositing of oil on motors and other electrical equipment is very likely to cause premature deterioration of insulation.

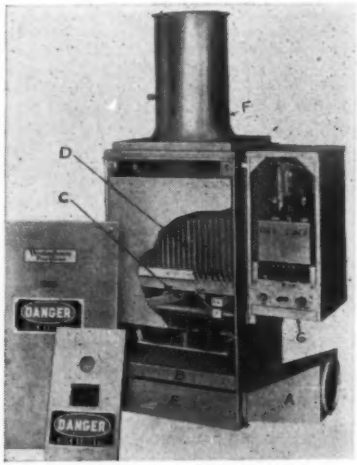
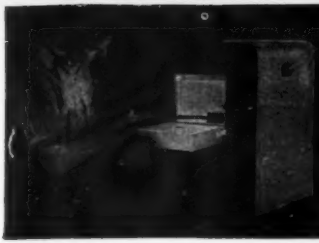


Fig. 3—Integral Fan and Power Pack Oil Mist Control Unit.

There are two methods of applying air cleaning. One contemplates the use of a central exhaust system from each machine tool which leads to a large capacity cleaning unit. Such an installation is shown in Fig. 1. It collects oil mist from high speed grinders, which heat and churn the cooling oil into a cloud that passes into the atmosphere of the shop. In this instance the device is mounted overhead and is out-of-the-way, but it can be placed in any convenient location.

The other method of application is by using a standard unit for each ma-

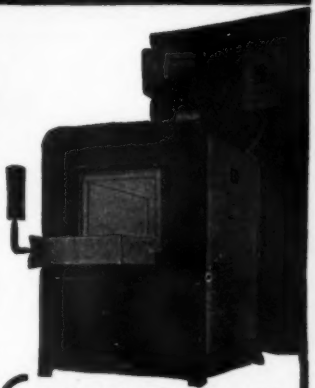


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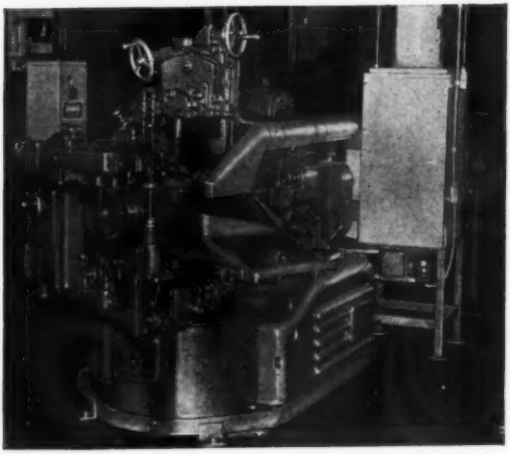


Fig. 4—Where Westinghouse Precipitron oil mist control units cannot be mounted to machine tool, channel iron bases can be used. Note that power pack has been mounted to the left of tool.

chine (Fig. 2). This is a more flexible method, especially if there is a possibility that the machines may be moved from one location to another, as it permits easy regrouping. It may be mounted beside the machine and over the oil reser-

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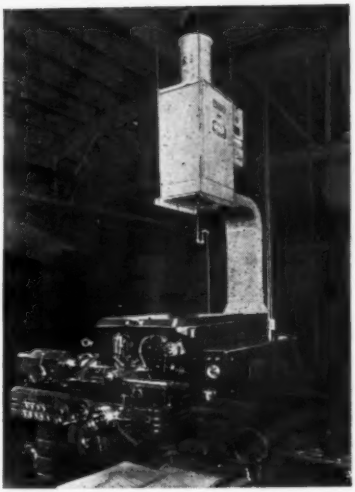


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voir so that as oil is removed from the air it may run back into the reservoir. Or, if more convenient where floor space is limited, the individual unit may be mounted on a pillar or overhead steel work.

The way the Precipitron works is simple and easy to understand. It has no moving parts, is silent and removes particles down to 1/250,000th of an inch in diameter, which of course includes oil particles. These particles receive an electrostatic charge and are deposited on collector plates. Clean air is discharged. By referring to Fig. 3 it will be seen that the coolant mist is drawn into the intake duct (A), thru one or more hoods located at the high speed cutting or grinding tools. From (A) the mist laden air passes into the unit thru a 2" mechanical filter (B) for the removal of large metallic and abrasive particles and then to the electrostatic field (C) at the bottom of the cell. Each particle of oil, etc., here becomes electrically charged and is attracted to the oppositely charged collector



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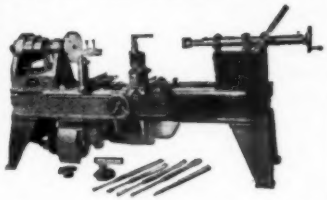


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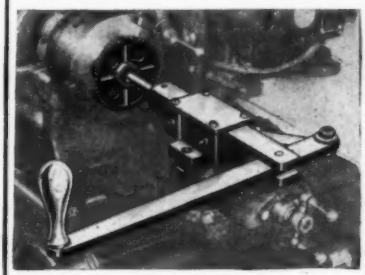
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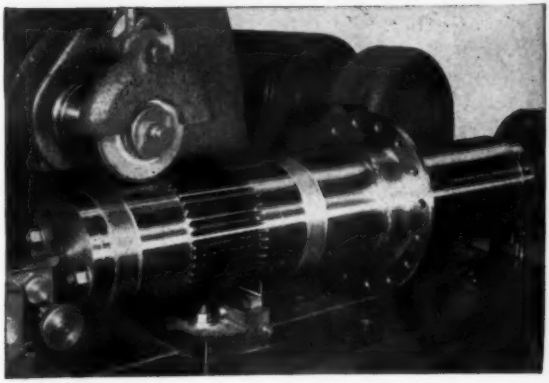


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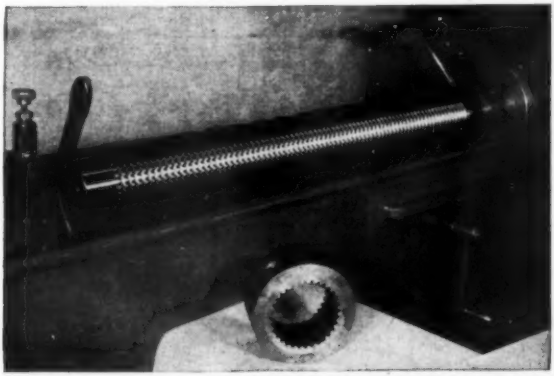
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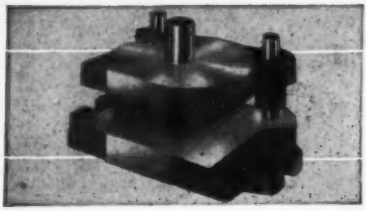
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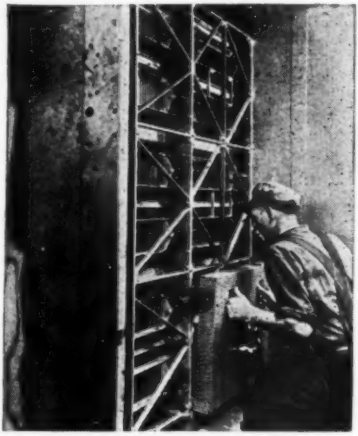
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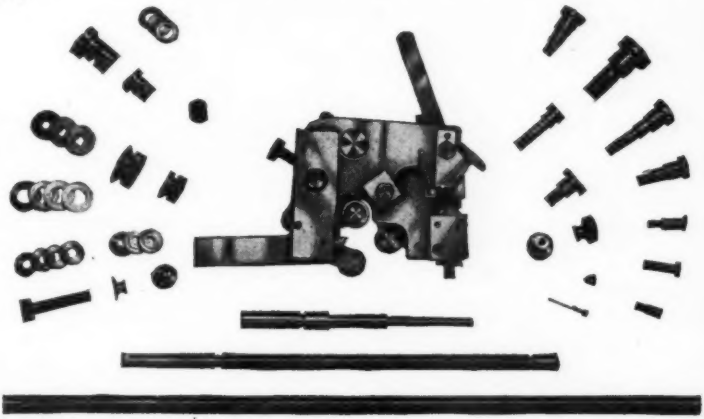
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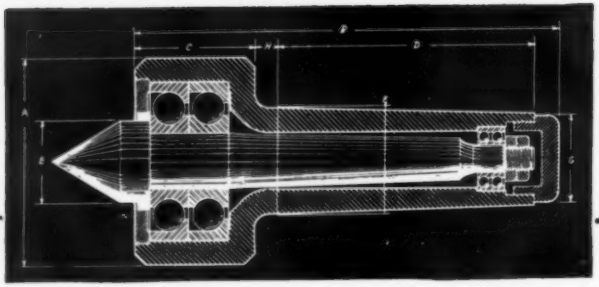
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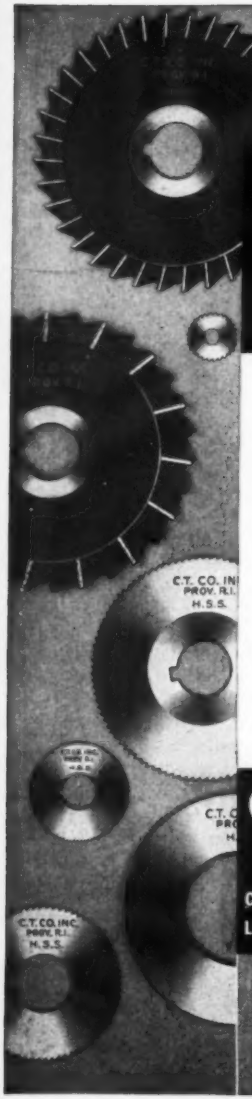


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Types of Resistance Welding Work

By F. R. WOODWARD*

RESISTANCE welding is the process of joining two or more metallic parts into an assembly—heat for formation of the weld being created by resistance of the metallic parts and welding machine electrodes to passage of the electric current supplied by the welding machine. Not all of this heat is generated at the desired point—at juncture of the weldments. Flow of heat to or from the juncture, assisting or retarding localization of the welding heat, is governed by the heat gradient established by the welding current acting on the various resistive components.

The heat being generated in these parts is calculated by the formula $H = I^2Rt$, where "H" represents watt-seconds, "I" is amperes flowing thru the weld point, "R" is resistance in ohms, and "t" is time in seconds.

Resistance to the flow of current, thus resulting in production of heat, exists at several different points:

1—In the materials being welded.

2—In the electrode materials.

3—At the contact between weldments (affected by several conditions, scale, pressure, etc.)

4—At the juncture between electrodes and weldments (affected by electrode conductivity, several conditions, and area of contact as well as by the weldment surface conditions).

The greatest heat losses, reducing the total heat available for welding, are those removed from the weldments by the electrodes which are often water-cooled, and by conduction thru the material in

*Westinghouse Electric Corp., East Pittsburgh, Pa.

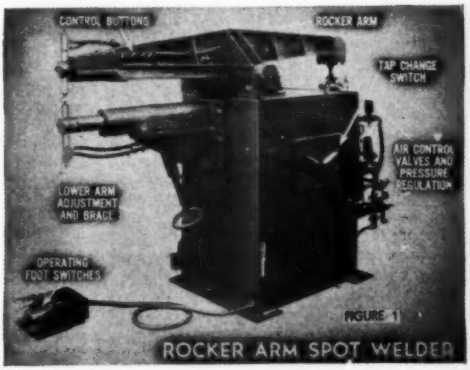


Fig. 1—The Rocker Arm Welder is one of the more common types. The machine shown is one of the larger, higher speed machines of this type.

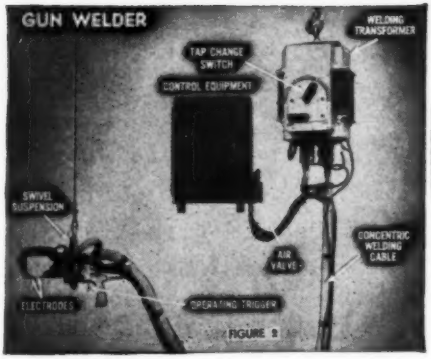


Fig. 2—The Gun or Portable Welder is another familiar type. Control equipment and transformer usually are mounted to be more or less stationary.

the weldments themselves, usually from the localized area where it is desired to produce the weld.

To produce strong welds, it is usually necessary to bring the "faying" or contacting surfaces of the two weldments up to their respective welding temperatures at the same time and cause a blending of a portion of each weldment in the formation of a "weld zone", "nugget", or "slug", terms usually typical of a certain type of resistance welding. Thus it is difficult to produce a satisfactory weld between dissimilar metals which will not alloy, and any weld so produced—often termed a "stick" weld—will be nothing more than a surface molecular interlocking joint.

Product Design Considerations

The primary advantage of resistance welding in the joining of metals lies in its speed of operation. Because of the desired high speed of operation, and also because heat losses in the weldments and electrodes must be minimized to prevent warping and burning, each weld must be made in a very short time. Thus, the welding power required is considerable even for a thin gage welding job. Therefore, it can be said that, in a general way, resistance welding is applied most frequently to thin metal fabrication. The heavier materials require more heat and power and can usually be fabricated more advantageously by means of arc or torch welding, etc.

Since the advantage of resistance welding lies in speed, it is desirable to design the product to be welded so as to permit use of as simple a welding machine as possible. It is especially important that the product be so designed as to avoid complicated current carrying members in the welder which must be cleared when loading the parts into the machine.

If possible, the product should be designed so that simple electrodes may be used in the welder. This is because the more complicated electrodes usually require quite intricate passages for the proper water cooling so essential for a high rate of production and reasonable maintenance cost of the welder.

Since electrode maintenance is usually a considerable factor on any resistance welding equipment, the parts to be welded should be cleaned properly, so they will have little or no dirt, scale, dust or other materials which may tend to burn or foul the electrodes.

Spot Welding

Spot welding is that resistance welding process which unites two or more flat sheets of metal by concentrating both pressure and the welding current at a point by means of relatively small electrodes.

In practice, the spot welding process must embody a synchronization of the

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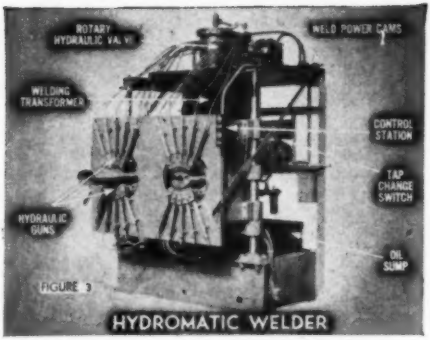


Fig. 3—This Hydromatic or "Oil Spot" Welder is built to handle two complete automobile muffler assemblies of four parts.

mechanical operation of the welding machine with the application of electrical energy thru the electrodes and material, so that application of pressure will both precede and follow application of the welding current. This is to insure that full electrode pressure shall be attained prior to the welding discharge. Also that this pressure be maintained until the weld "nugget" shall have cooled to a temperature where it regains a large portion of the inherent metal strength. The cooler, harder material surrounding this weld nugget is thus forced by the welding pressure to move along with the inner plastic core of the weld as the latter shrinks during the cooling process. Cracks in welds are therefore an indication of the possibility of an excessively short "hold" time after cessation of welding current flow.

Length of application of welding current is dependent entirely on the materials being welded and inherent characteristics of the welding machine itself. For instance, if the machine should be somewhat deficient in pressure available, it will be impossible to use the higher values of current without expelling weld metal, and a longer weld time period with a lower current value must be used to produce the weld. Furthermore, the dynamic pressure characteristics of different types of machines may be sufficient to change considerably the optimum welding set-up values required for given welding jobs. This is one reason why there is considerable diversity of opinion regarding proper welding set-up for any given job.

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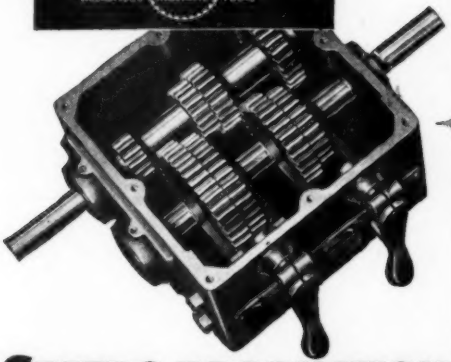
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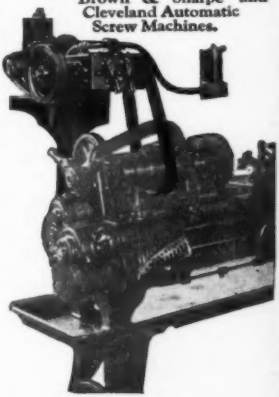
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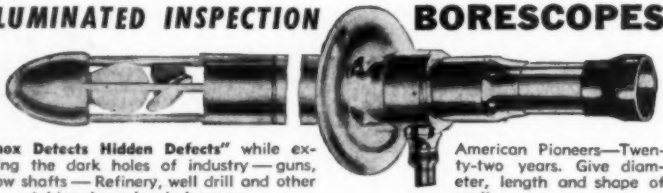


FIGURE 4

power while maintaining electrode pressure on the work; is advantageous because this process permits the building up of spot diameter with relatively long overall time of power applications. This timing control permits the welding of heavier materials with a given machine than would otherwise be possible since the pressure requirement for the production of a satisfactory weld is about 30% lower than that required for a single impulse weld. Current used for the production of a pulsation weld is also about 30% less, altho the total time of application is usually about 200% longer. Pulsation welding is preferable on low conductivity materials (less than 20% copper, International Annealed Copper Standard) where the materials being welded are greater than ⅛" in thickness. Thus, on any machines expected to weld heavy material, the slight additional expenditure for this feature is well justified.

"Program" timing is a variation of pulsation weld-timing which consists of unequal lengths of time of power application with unequal "cool" times interposed between. This process is particularly useful when welding steels which harden when cooling from the welding temperature. By use of this control, the steels may be preheated, welded, tempered, and refined in grain structure, all automatically in the welding machine by proper timing of the current impulses.

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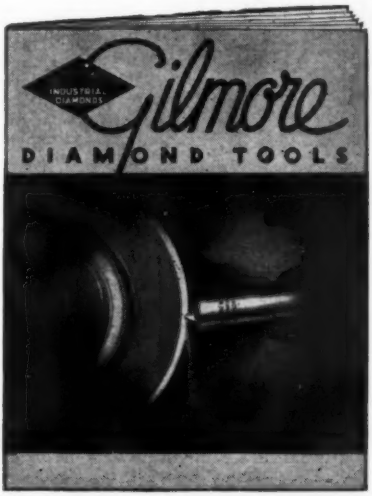
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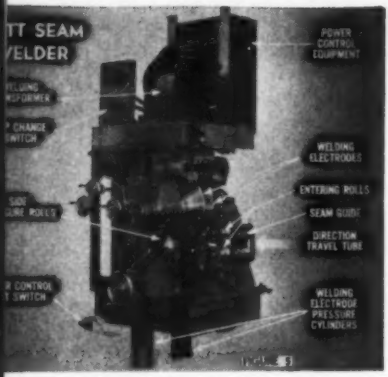


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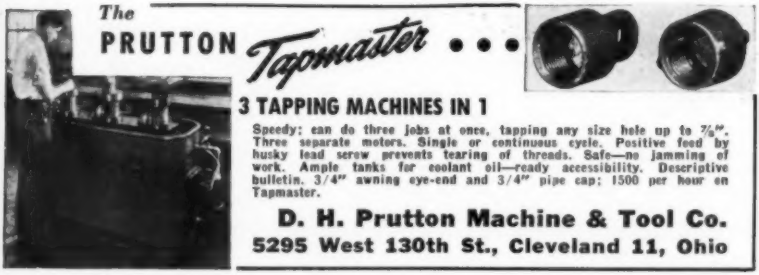
Spot Welding Machines

Many types and modifications of spot welding machines are manufactured at present by welding equipment manufacturers. One of the more common of these types is the rocker arm spot welder, an illustration of which is shown in Fig. 1. This is one of the larger, higher speed machines of this type, mechanically operated by air pressure which is controlled by means of a number of solenoid valves mounted at rear of the machine, and operating an air cylinder, also at the rear, connected to the back end of the "walking beam" or rocker type upper arm. Thus, the welding pressure is applied at the electrode with a minimum of equipment near the electrodes. This permits easier handling of parts to be welded. The electrodes and electrode holders are water cooled, and the lower arm is adjustable in height. The welding transformer is located inside the frame of the machine, with a tap switch mounted on side of frame for convenient adjustment of secondary voltage. Adjustment is obtained by varying the number of primary turns of the transformer.

Other types of rocker arm machines are mechanically operated by hydraulic fluid. Others are cam operated, the cam being driven by a motor working thru a gear box. Still other lighter machines are operated by foot pressure where pressure requirements of the machines are not excessive for this method of application.

The "press" type spot welder is quite similar to the rocker arm type except that the upper electrode assembly is carried by a slide which moves in ways with a vertical motion. With this type machine, accurate electrode alignment is not disturbed by variation in thickness of the work being welded or by a change in length of the welding electrode in use. Press type spot welders are also supplied with air, hydraulic, cam or foot operation for mechanical movement and pressure requirements.

Another type of spot welder is the "gun" or portable welder, shown in Fig. 2. The control equipment and transformer are usually mounted more or less stationary. The gun which carries the electrodes and pressure actuating mechanism is usually counterbalanced to prevent undue operator fatigue and connected to the transformer by means of



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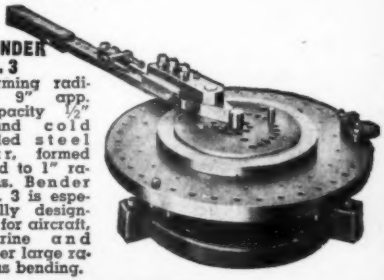
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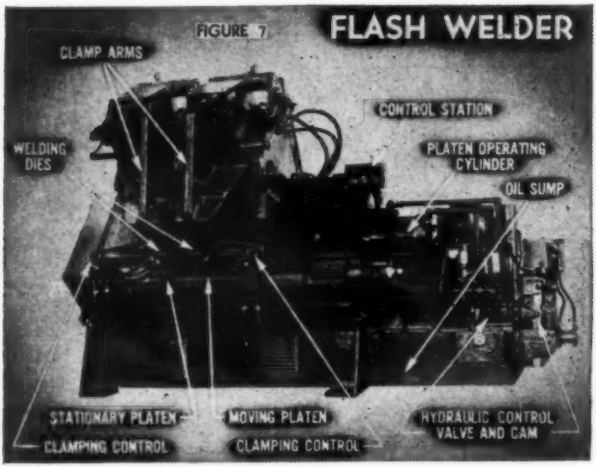
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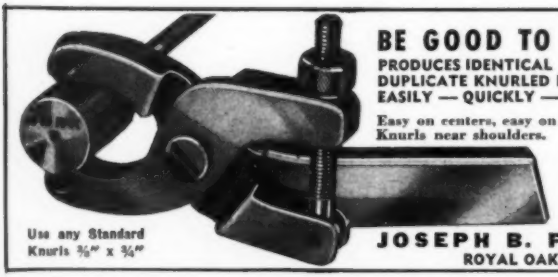
flexible cables carrying secondary current from the transformer. Water cooling lines and control cables also go from the stationary equipment to the guns so that full control of the gun may be maintained by the operator. Gun welders are particularly useful in welding large assemblies which cannot be moved to stationary welding machines. These assemblies frequently must be held in position to close limits by means of rigid jigs, necessarily rather cumbersome to handle.

in Fig. 3, which in this case accepts two complete automobile muffler assemblies of four parts as illustrated at base of the machine. This machine when loaded and initiated by the welding operator transmits hydraulic pressure, from the rotary hydraulic valve at top of the machine, individually in sequence to each of the 10 welding guns on either side. A rotary weld initiating cam is synchronized with this hydraulic valve. Thus, in operation, the first gun contacts the work under

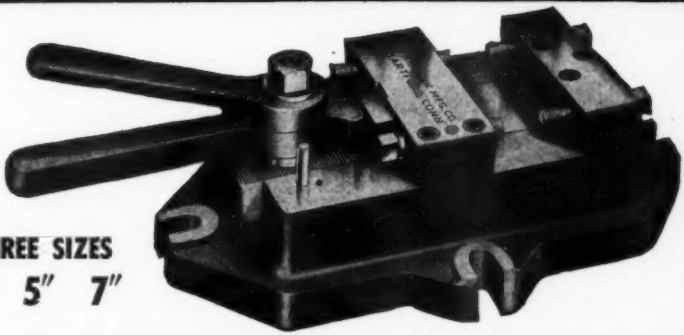


Another type of spot welding equipment is known as "hydromatic" or "oil spot". A type of this equipment is shown

pressure, the weld current flows thru the electrode for a preset time value, the gun moves to the retracted position, and


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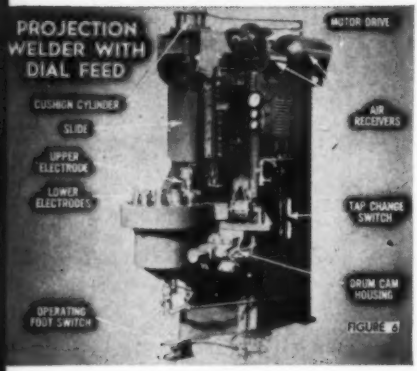
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the second gun starts its cycle. Welding of each baffle in the tube is thus accomplished automatically with a minimum of operator attention. The welding transformer in this case is located inside the framework and its secondary voltage controlled by means of taps on the primary windings brought out to a tap change switch shown on back of the machine. A machine of this type is always built for a particular welding job and thus requires special design and application efforts.



Electrode Materials

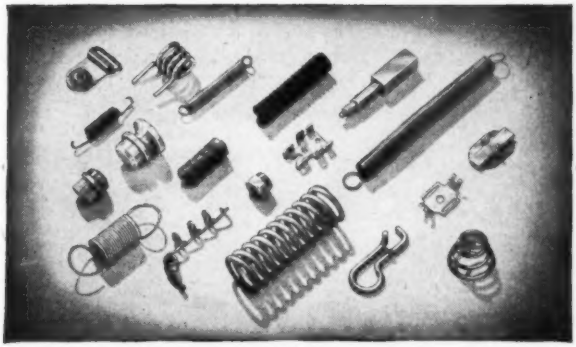
The electrodes of any resistance welding machine are of prime importance from the standpoints of production quality, and reduction in operating cost and maintenance. Electrode materials must have rather high conductivity in order to carry the large currents required without burning or blistering, with attendant work-marring effects. Electrodes also must have considerable mechanical strength in order to withstand the high welding pressures and repeated impact on the materials being welded. Since, in operation, the electrode face becomes quite hot, it is desirable that its material have an annealing temperature as high as possible.

Various electrode manufacturers are marketing materials which combine hardness and good conductivity to a remarkable degree. Different alloys give varying combinations of these qualities. One alloy may have a conductivity of 80% of pure copper and a hardness of Rockwell 68B, while another has a hardness of 100B but only 29% conductivity. (See Fig. 8).

Therefore, it is necessary to select the proper electrode material having sufficient conductivity to prevent burning or alloying of the tip face. Also it should be hard enough to retain its proper contour in operation. An engineering compromise is usually necessary between these two features since no electrode material can have both maximum hardness and conductivity.

Electrode Usage

Proper cooling of the electrodes, obtained by passing two to three gallons per minute of water having a temperature of less than 70° F, will be a material aid in reducing the "fouling". It lowers the temperature of the electrode surface to a point where it has less ten-



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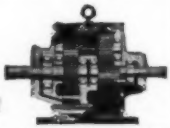
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dency toward alloying with the material being welded. Strength of the electrode material also will be considerably greater if the temperature be maintained at a low value. Surface temperature of any electrode may be reduced by: use of electrode materials having high electrical and thermal conductivity; use of low temperature cooling water impinging at high velocity on the inner surface of the electrode; use of electrodes having their inner surfaces corrugated or finned to increase heat transfer rate, and maintenance of a clean, well fitting joint between the electrode and the electrode holder.

Maintenance of a given contour or tip diameter during production is necessary to control the welding results obtained on a given machine. If the control required is not particularly critical, tip maintenance may be very well accomplished by the operator using a file on the electrodes, while they remain in the machine.

If welding is on critical materials or on jobs which require very consistent results, it will be necessary that the electrodes be machined periodically on machine tools so the electrode diameter or contour may be re-established perfectly before they change to a degree which may affect the weld consistency.

Adequate electrode pressures result in these effects contributing to good welding results:

1—Production of local intimate contact, concentrating current flow to the desired area.

2—Reduction in weld porosity caused by low boiling point of certain elements.

3—Assistance in reducing cooling cracks by compensating for internal shrinkage with an external follow-up pressure.

4—Reduction of the tendency for the electrodes to alloy with the material being welded.

Electrode Design

There are two general types of electrode faces in favor at the present time for spot welding. The "dome" type has a

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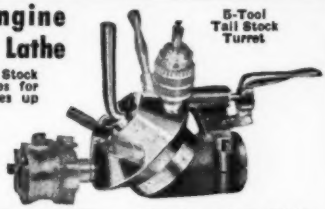


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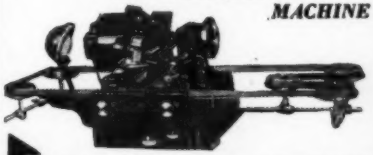
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Class 3.	TB	Mall. 100 & Trod. 1	Alloy W5	Tuffaloy 55	Rods, Bars, Castings, Forgings
GROUP B- COPPER-TUNGSTEN ALLOYS					
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Class 11	Electroloy 10W3	Elkonite 10W3	Alloy 10	Tuffaloy 10W3	Rods, Bars, Inserts
Class 12	Electroloy 20W3	Elkonite 20W3	Alloy 20	Tuffaloy 20W3	Rods, Bars, Inserts
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GROUP A										
Class 1		20,000		68***		80		60,000		20
Class 2	20,000	35,000	55	75	70	75	45,000	65,000	15	15
Class 3	45,000	50,000	95	95****	45	45	85,000	100,000	10	10

	ULTIMATE COMPRESSIVE STRENGTH P.S.I.		
GROUP B			
Class 10	78	40	135,000
Class 11	98	30	160,000
Class 12	100	29	185,000
Class 13	38 Rockwell C	28	225,000

* At Room Temperature and sensitivity 1 in 100,000

** Based on Cast Tensile Bars

*** For Section not exceeding 1 inch square

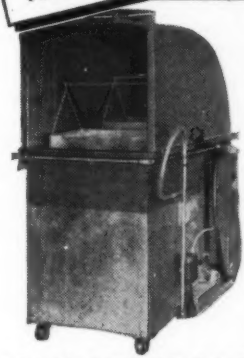
**** 90 Rockwell B on finished rods

Approved March 15, 1940

FIGURE 8

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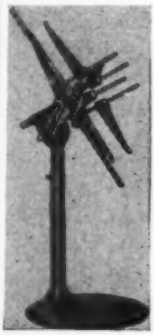


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spherical radius formed on its working face. The optimum radius of this dome usually increases with the yield point of the material welded, and also with the thickness of the material but to a lesser degree.

The "flat" type electrode may be flat for the full area of the electrode to reduce weld marking of the material, when its mating electrode must provide additional localization of heat and pressure; or it may be flat for a reduced section at the tip of a truncated cone form, the sides tapering back to the full electrode section at an angle of 30 to 45° to the face. With this type electrode, the diameter of the contacting face is usually equal to $2t + .1"$, where "t" is thickness of the contacting sheet of material.

In use, the flat electrode retains its shape better than the dome type but is more difficult to clean or resurface repeatedly in the welding machine and still maintain proper contour. Thus, when welding materials which necessitate frequent cleaning of electrodes, dome tips are preferable.

A commonly accepted electrode for use on mild steel or other non-critical welding materials is one having a flat face with a radius edge, contributing to ease of maintenance but not lending itself to precise control of welding conditions. Use of the formerly-popular "conical" tip with sides of face 7° or 11° angled from plane of the surface welded, was a concession to the relatively high conductivity of aluminum. It was useful in lowering the power requirements of the material, but at the expense of quality of weld and final surface appearance. This tip is not satisfactory for aluminum welding for aircraft fabrication.

Welding electrodes should be easily removable from their holders to facilitate replacement for remachining or substitution of a new type required. Types of electrode mountings or means of clamping are too numerous to detail, all having their peculiar advantages—and disadvantages.

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TABLE 1 - BASIC SPOT WELDING VALUES

USED ON LOW CARBON, HOT ROLLED, CLEAN STEEL

Sheet Against Smaller Tip		Smaller Tip		Electrode Force Pounds	Weld Current in Amperes		Weld Time Cycles (1/60 Second)	Spot Shear Strength Pounds
US Gage	Thickness Inches	Flat Diameter	Spherical Radius		Flat Tips	Radius Tips		
44	.004	.108"	1"	130	4,100	4,700	2	40
38	.006	.112"	1"	150	4,200	4,800	2	70
34	.008	.116"	1"	170	4,300	4,900	2	110
32	.010	.120"	1"	190	4,400	5,000	2	155
30	.012	.124"	1"	210	4,500	5,100	3	200
28	.015	.130"	1"	240	4,600	5,300	3	260
26	.018	.136"	2"	270	5,000	5,500	4	330
24	.024	.148"	2"	330	5,400	6,100	4	500
22	.031	.162"	2"	400	6,000	6,800	5	750
20	.037	.174"	2"	460	6,500	7,600	5	1,100
18	.049	.198"	4"	600	8,000	9,400	6	1,800
16	.061	.222"	4"	700	9,300	11,400	7	2,600
14	.077	.254"	4"	870	11,300	13,500	8	3,600
13	.092	.284"	4"	1,030	13,000	15,400	10	4,300
11	.122	.344"	6"	1,400	15,500	18,500	14	6,200
9	.153	.406"	6"	1,800	17,900	21,200	20	8,200
7	.184	.468"	6"	2,210	19,200	23,100	30	10,000

For materials other than low carbon, hot rolled, clean steel, the approximate spot weld set-up values of pressure, current, time, and spot strength may be obtained by multiplying the basic values indicated in Table 1 by the percentages appearing in Table 2.

EXAMPLE: .077" aluminum alloy 52S-½H.

From Table 1 a basic pressure value for .077" material is 870 pounds.

From Table 2, for 52S-½H, a pressure factor of 130% is indicated.

Thus, proper spot weld pressure is 1.3 x 870 = 1131 lbs.

Also, from Table 2 a radius tip is recommended.

Table 1 indicates a basic current value of 13,500 amperes for radius tips on .077" material.

Table 2, for 52S-½H, shows a current factor of 300%.

Thus, proper spot weld current is 3 x 13,500 = 40,500 amperes.

LEGEND — TABLE 2

A	Annealed	FH	Full hard	OH	Soft
Al	Aluminum	FR	Flat or radius face	R	Radius
CR	Cold rolled	HR	Hot rolled	Si	Silicon
Cr	Chromium	HT	Heat-treated	Sn	Tin
Cu	Copper	Mn	Manganese	T	Heat-treated
F	Flat face	Mo	Molybdenum	½H	Half hard
		Ni	Nickel		

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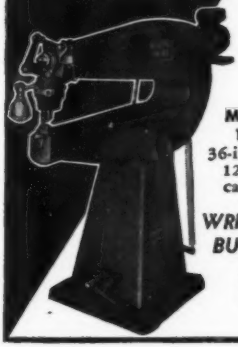
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ed in a correspondingly tapered socket in the point holder. A more common taper is known as the "Morse taper", in which included angle of the taper is about 3°. This taper is very satisfactory for sealing the internal water pressure necessary for proper circulation of tip coolant. However, with this slight taper, large expanding forces are created by the welding force necessarily imposed on the electrode face. Thus, with welding forces over 500 pounds on the ½" diameter electrode and 1000 pounds on the ⅝" electrode, expanding force becomes excessive, resulting in distortion of the point holder and extreme difficulty in removing electrodes. These loadings, however, are no more important than the impact loadings developed when the electrodes contact the material being welded. No convenient means of measuring this impact value is ordinarily available to the user other than noting the rate of deterioration of electrodes and holders.

To permit use of medium diameter electrodes at higher welding pressures and to facilitate tip replacement—(features necessary for aircraft aluminum welding)—the so-called 6° taper tip was developed. This electrode has an included angle of taper of 12°. It is not very satisfactory for sealing the coolant pressure and is not usable at any great degree of angularity with the work—transverse forces tending to loosen the tip in the holder.

More useful tapers are those developed and used by Fisher Body Division of General Motors, with tips having an included angle of about 6°; and by Ford Motor Co., having an included angle of 8°. These tips are usable at much higher pressures than the conventional Morse tapers and are satisfactory in sealing coolant pressures. More universal usage of one of these tapers is anticipated after cessation of present wartime standardization efforts.

Determination of Welding Set Up

It is possible to predict the approximate spot welding set-up values required

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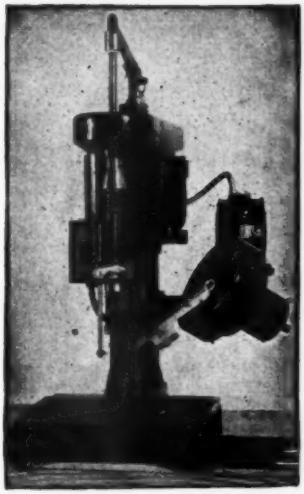
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TABLE 2 - METALS AND ALLOYS

BASIC FACTORS APPLIED TO SPOT WELDING
(From Comparison of .040" Thicknesses)

Metal	Condition	Yield Strength .2% Offset	Melting Point °F	Electrical Conductivity % Copper	Electrodes		% Basic Mild Steel Value			
					Class Material ‡	Shape	Electrode Force, Pounds	Weld Current Amperes	Weld Time Cycles	Shear Strength Pounds
WROUGHT IRON	HR	30,000	2720	12	1	FR	100	90	100	90
STEELS—PLAIN										
Low Carbon (SAE #1010)	HR	40,000	2760	15	2	FR	100	100	100	100
	CR	50,000	2760	15	2	FR	120	110	100	120
Low alloy	HR	60,000	2750	15	1	FR	120	100	120	120
Alloy	HT	120,000	2720	15	2	FR	200	100	100	200*
Stainless — SAE #321, 347	QH	40,000	2570	2.4	3	FR	120	60	80	140
	FH	100,000	2570	2.4	3	FR	200	70	100	200
STEELS—COATED										
Aluminized	...	40,000	2760	15	1	FR	120	110	100	100
Cadmium-plated	...	40,000	2760	15	1	FR	120	110	100	100
Chrome-plated	...	40,000	2760	15	2	F	110	100	100	100
Copper-plated	...	40,000	2760	15	1	FR	110	110	100	100
Galvanized	...	40,000	2760	15	1	FR	120	110	100	100
Nickel-plated	...	40,000	2760	15	1	F	110	100	100	100
Terneplate	...	40,000	2760	15	1	FR	120	110	100	100
Tin-plated	...	40,000	2760	15	1	F	110	100	100	100
ALUMINUM ALLOYS										
2S	0	5,000	1210	50	1	1"R	80	250	80	22
3S	½H	18,000	1200	41	1	2"R	100	280	80	32
52S	½H	29,000	1170	40	1	3"R	120	300	80	42
Alclad 24S	T	43,000	1070	39	1	3"R	200	320	80	40
MAGNESIUM ALLOYS										
Dow Metal "M" 1.5 Mn "J" 6. Al	...	27,000	1200	28	1	3"R	130	290	80	28
	...	34,000	1140	13.5	1	6"R	170	230	80	33
NICKEL	A	20,000	2625	18.2	2	F	100	120	80	90
	CR	95,000	2625	18.2	2	F	140	140	100	110
NICKEL ALLOYS										
Nichrome 20 Cr	CR	60,000	2550	1.6	2	F	120	50	120	110
Inconel 13 Cr	A	35,000	2570	1.8	2	F	100	40	100	130
	CR	110,000	2570	1.8	2	F	140	60	120	160
Monel 30 Cu	A	35,000	2400	3.6	2	F	100	60	100	110
	CR	100,000	2400	3.6	2	F	140	70	120	140
Nickel Silver 10 Ni	CR	75,000	1850	8.3	3	FR	120	100	120	130
COPPER	CR	48,000	1980	100 †	Mo	3"R	100	350	100	100
COPPER ALLOYS										
Red Brass 85 Cu	CR	70,000	1875	37	13	4"R	120	190	120	120
Yellow Brass 65 Cu	CR	75,000	1710	26	2	4"R	120	150	120	130
Admiralty Bronze 70 Cu	CR	90,000	1715	25	2	4"R	120	120	120	140
Naval Brass 60 Cu	CR	65,000	1625	25	2	4"R	120	150	120	120
Munts Metal 60 Cu	CR	80,000	1660	29	2	4"R	120	150	120	130
Manganese Bronze 58 Cu	CR	60,000	1645	25	2	4"R	110	140	120	120
Phosphor Bronze 5 Sn	CR	75,000	1920	18	2	4"R	120	120	120	130
Aluminum Bronze 8 Al	FH	105,000	1905	15	2	4"R	120	110	120	150
Silicon Bronze 3 Si	CR	70,000	1885	6.7	2	4"R	120	80	120	120
Nickel Silver 10 Ni	CR	75,000	1850	8.3	2	FR	120	100	120	130
PRECIOUS METALS										
Silver	CR	40,000	1760	106 †	Mo	F	100	350	100	100
Gold	CR	30,000	1945	71 †	Mo	F	100	330	100	80
Platinum	CR	37,000	3225	15	1	F	100	110	100	80
Paladium	CR	32,000	2830	15	1	F	100	100	100	90

† Weldability improved by plating. Difficult in thicknesses over .030".

* Many alloy steels require heat-treatment after welding for satisfactory physical properties. See legend below Table 1.

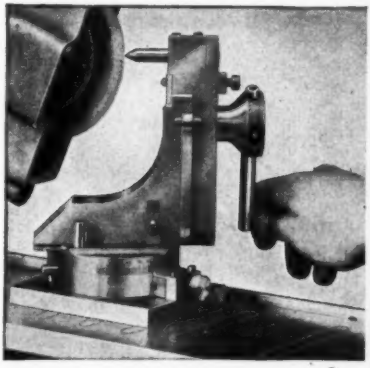
‡ Resistance Welder Manufacturers Association "Equipment Standards".

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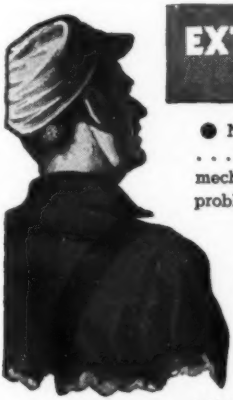
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from an examination of the physical characteristics of a given material. Thus, the proper electrode material is selected after consideration of the electrical conductivity, surface conditions, and yield strength of the weldment materials. Lower conductivity of the material allows usage of lower conductivity, harder electrodes. Poor surface conditions are compensated for by softer, higher conductivity electrodes. Low yield strengths enable use of high conductivity electrodes, because these softer electrodes will not "mushroom" excessively at the lower welding pressure required.

The time of power application or "weld time" required for the production of a spot weld, having best characteristics of internal weld and external appearance, appears to be governed almost entirely by thickness of the materials being welded unless there are surface conditions which must be overcome during the welding process, such as rust, scale, or oxide which prevent passage of the proper welding current during initial portion of the cycle.

Too short a weld time necessitates larger welding currents which result in "splashing" of molten metal from under the electrode contacting faces as well as production of a thin weld "slug" or nugget" at the materials' interfaces which has insufficient ductility or strength for most design requirements.

A weld time of too long duration results in excessive heat losses which cause discoloration or burning of material surrounding the weld, unnecessary warping or buckling of the welded assembly, and rapid electrode deterioration.

As a general rule, the weld time may be set up as equal to 150 to 250 cycles per inch thickness of the sheet, where one cycle is 1/60th second. Few spot welds require less than three cycles for good results. Timing of less than five cycles should never be used with non-synchronous equipment. If welding equipment is deficient in pressure or welding current, or has high mechanical inertia, it will be necessary to increase weld time to get best results.

The pressure requirements for a spot weld are determined by the material's thickness, yield strength, and surface conditions, the stiffness of a sheet is proportional to the cube of its thickness. However, since a longer weld time is used on thicker material, the weld current reduces this yield strength effectively until the pressure requirement for a spot weld is almost directly proportional to the thickness of the material. This pressure requirement is also proportional to the yield strength and is increased by presence of scale, dirt, or other coatings on the material.

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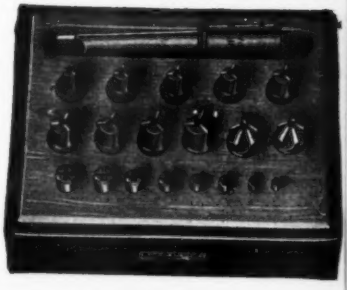
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Thus, while .050" thicknesses of hot rolled, mild steel, pickled, can be welded readily with 600 pounds tip force, thicknesses of .110" will require 1200 pounds for best results, and a steel such as NAX 9115 having twice the yield strength of mild steel, will require 1200 pounds for best results on .040" thicknesses. Presence of coatings such as galvanizing, etc., or scale, increase pressure requirements about 30% for best results.

The current required for a spot weld is, of course, determined somewhat by the preceding factors of electrode contour, weld time, and electrode force or weld pressure. To an even greater degree, this requirement is based on the electrical conductivity, thermal conductivity and melting point of the materials welded. Since the thermal conductivity is, to a degree, proportional to the electrical conductivity, and is largely related to the heat losses of the weld power, it can be safely neglected. The melting point, while not necessarily the actual forging temperature required for welding, is a very important characteristic in estimating the weldability of dissimilar metal combinations.

Positioning Devices

Jigs and fixtures are necessary on many welding jobs for proper alignment of the parts to be welded so that the completed assembly may perform its function properly. These fixtures must be built so that they will not allow "short circuiting" of the secondary current from the point of welding thru which the current should be directed. To maintain proper production, fixtures should allow rapid loading and unloading of the parts, and if the fixture is to be used at a stationary machine, it should be light enough to permit rapid handling without operator fatigue. If the fixture is to be used with portable or gun type welders, it may be considerably heavier, but should be designed to provide proper clearance for the gun being used for convenient reading of all parts to be spot welded.

Machine Maintenance

Little can be said regarding machine maintenance except that each machine has its own upkeep requirements, governed largely by its engineering design. With all types of machines, however, the entire secondary circuit should be dismantled and cleaned with steel wool at intervals of from one to three months, depending on industrial atmospheres and weld consistency results desired from the machine. With air operated machines, a troublesome item is that of air valves requiring frequent magnetic solenoid replacements. Cam operated machines usually require considerable maintenance on the gear box and clutch between driving motor and the operating cam.

(To be continued)

MACHINE TOOLS AND JOBS

Where do machine tools come into the nation's postwar employment picture?

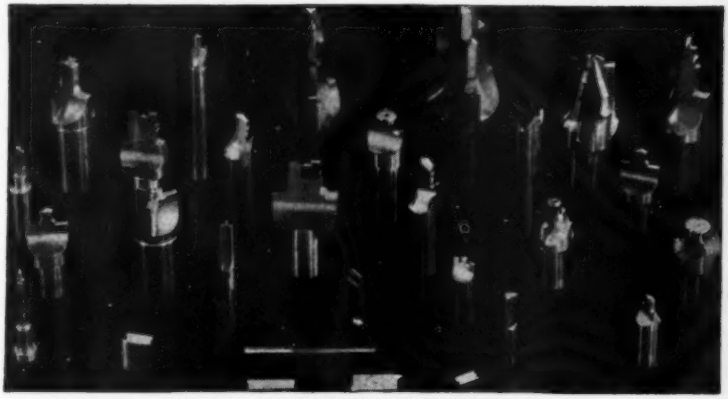
That question was answered by Tell Berna, general manager of the National Machine Tool Builders' Association, in a feature article reviewing the industry's prospects after the war which appeared in the Lee Traveller, weekly publication for soldiers at the home of the Army's combat quartermasters and supply specialists, Camp Lee, Va.

Pointing out the machine tool builders comprise a small, but key industry that employed approximately 39,000 workers before Pearl Harbor and about 153,000 at the peak of the war production cycle, the NMTBA chief said that "our contribution to postwar employment cannot be to any great extent in our own shops, but it must be by way of our product."

Jobs are the most important things after the war and they depend largely upon prices, Berna further asserted, adding that only thru the utilization of more efficient machinery can manufacturers reduce their costs and cut prices of their products. "The more a manufacturer is able to reduce the price of a good product, the more people he will get to buy that product, and therefore, the more people he can employ."

In the engineering departments of the nation's machine tool builders the NMTBA spokesman concluded, "men are busy designing the machine tools that will enable manufacturers to cut costs of production and thereby help to price their products on a basis that will insure a high volume of sales and employment."

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Let's Talk Shop

INDUCTION HEATING BRAZES TOOL TIPS

By T. A. VERNOR and E. F. ADAMS*

INDUCTION heating is making its place in many industrial processes because of the tremendous savings in time and consequent increase in production that is gained by its use. A recent installation at the Reed Roller Bit Co., Houston, Texas brazes alloy tool tips onto single point tools in a fraction of the time formerly required with acetylene gas torches.

Many tools are required at the plant, since the stock hardness of the product is approximately 350 Brinell and the tools break or dull from wear. When acetylene torches were used, the tool tip often was overheated and several minutes were required to braze each piece. Tool tips can now be brazed on 1½"x1½" tools, which are the largest used, in about 30 seconds using induction heating. Not only is the brazing job speeded-up, but the life of the tool is improved since the carbide tips and the soft steel shanks are heated at different rates and the tips do not reach the same temperature as the shanks. This is evident as the power input to a magnetic material is many times greater than to a non-magnetic material with the same flux density. Most of the heat put into the carbide tips is by conduction from the steel tools thru the silver solder.



As only about one inch of the tool is in the coil, all of the power is concentrated in a small volume in a very short time. This brings the temperature of the shank to about 1400°F in 30 seconds or less on one end of the tool—depending on the size of the shank—and leaves the other end cool enough to handle with the bare hands.

The work coil for this job was designed to handle several sizes of tools without adjusting the R. F. Generator or changing the work coils. This was accomplished by designing two coils and connecting them in series. One coil consists of six

*Westinghouse Electric Corp., Houston, Texas.

Model 25 Hi-Duty
Marking Machine



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Requires only a fraction of the applied pressure normally used for stamping—Thus preserving piece parts and adding to the life of your dies.

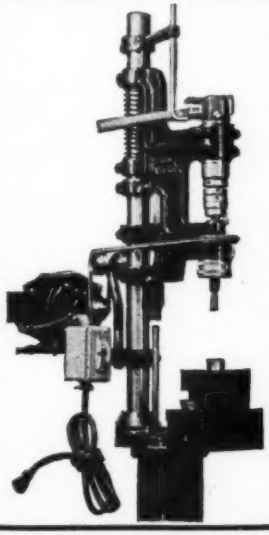
RAPID SET-UPS

The economy of rolled markings is self-evident, due to its speed and ease of operation, and Hi-Duty machines are designed by us for practically any marking operation. Have you a tough marking problem? Send us prints or samples of parts to be marked—showing lettering, location and required production—We will be glad to make recommendations.

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AIRFLEX peening method is uniquely effective on stainless steel. Fast, confined blows of Airflex roll and spread metal because each bit gets its localized share of work. Spreading is concentrated on the head.

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turns of ⅛" copper tubing 2"x2" on the inside square. The other coil also of six turns is 1½"x2" on the inside square. With both of these coils connected to the generator in series, it was found that all sizes of tools could be heated. This method enables the operator to handle several sizes of tools without first sorting them by sizes, and therefore increases the overall flexibility.

One safety feature of the Tuned Plate-Coupled Grid oscillator circuit that is used in the generator is the grounding of one side of the work coil thus putting it at a comparatively low voltage above ground. This is possible since most of the voltage is across the tank coil.

The R. F. Generator used is a standard 10 Kw, 459 kilocycle set. The power supply is 440 volts, 3 phase, 60 cycle. Control is by means of a "start-stop" button mounted on the face of the cabinet; additional remote control stations can be provided where required. On production work such as this where a definite time-heat cycle can be pre-determined, the automatic timer de-energizes the unit after a pre-determined time has elapsed. Protection to the generator is obtained by magnetic type overcurrent relays in the plate circuit of the rectifier and the grid circuit of the oscillator tube. The main line circuit breaker has thermal and instantaneous magnetic overload protection, and the control circuits are fused. The grid controlled 3 phase rectifier in this unit provides a flexible means for power output control to the work.

After installation and tune up, an inexperienced operator had no difficulty working with the generator and was soon very proficient in its use, both for brazing on new tips and removing those dulled by wear. As a result, the plant has experienced no tool shortage and one bottleneck in production was broken.

SET SCREW RECESS

Pulleys, gears, etc. are often difficult to remove from shafts because the set screws have gouged the surface of the shaft. To avoid this trouble, file or mill a flat surface on the shaft at the point where the set screw bears. Repeated assembly and disassembly for maintenance repairs will not mar the shaft when this method is used, and more-over the set

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DIE HEADS

Automatically opens at a predetermined length of thread.

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Button dies quickly changed.

Less set-up time. Low cost.

Accurate speedy thread cutting is assured with these DIE HEADS. A wide range of capacity of each size die head means a small investment, and makes this modern DIE HEAD the ideal general purpose thread cutting tool. For tough threading jobs where constant uninterrupted operations are essential, the BHICO DIE HEAD will do them.

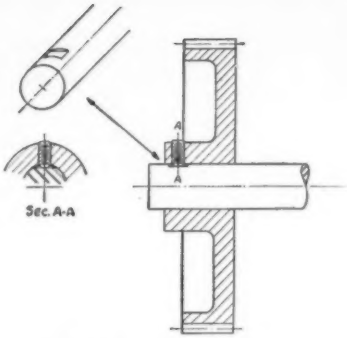
No fussy adjustments to be made; Dies removed by loosening of two screws.

In ordering BHICO DIE HEADS, specify DIE HEAD size and diameter of shank.

Ask your Dealer or order direct.

Write For Details, Circular C-1

B-H INSTRUMENT CO.
3321-23 AVENUE S BROOKLYN 10, N.Y.



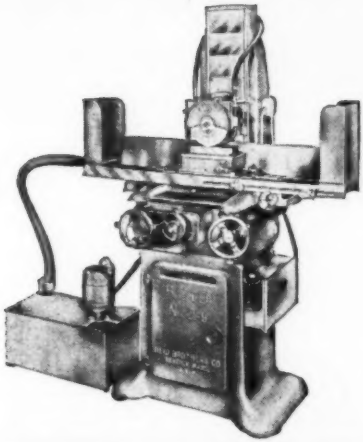
screw is far more efficient in preventing slippage while the machine is in operation.

SOLDERING LEADS



The use of a holding fixture and soldering transformer for soldering dynamotor leads to a terminal has greatly speeded up production at the Small Motor Division of the Westinghouse Electric Corp., Lima, Ohio.

Photo LW-2830 shows the old method of soldering one dynamotor lead at a time to a terminal. In this method the "holding fixture" was a plate with a hole drilled in it to suit the terminal; a



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Multi-Wheel Numbering Machine Model 70



The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Stamps numbers, etc., quickly . . . neatly. Perfectly aligned. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20.

Model No. 70

Write for Bulletin BB-70.

Automatic Indenting Numbering Head Model 50

Automatic indenting numbering head for consecutive or repeat numbering. 1/32" up to 3/8" high figures can be furnished in sharp face Gothic or shaded Roman figures. Prefix or suffix letter wheels. Bench, foot, or power presses can be used.

Numbers: radio, airplane, tool parts, name plates, and other objects in brass, steel, fiber, plastics.

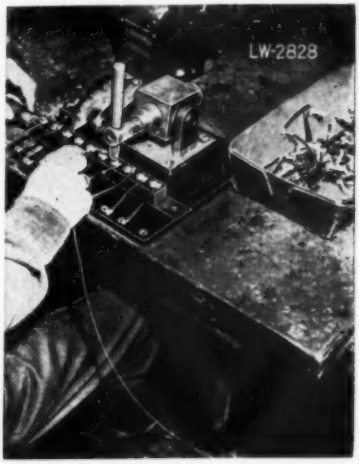
Heads are of sturdy construction and give uninterrupted marking service.



Model 50

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

copper tip soldering iron was used in the soldering operation.



With the method shown in Photo LW-2828, after the fixture holding the terminals is positioned with the left hand, the carbon electrode, which is connected to one of the transformer leads is lowered until it touches the terminal. This completes the circuit since the fixture is connected to the other transformer lead. Immediately enough heat is generated to melt the solder which flows over the faces of the clips.

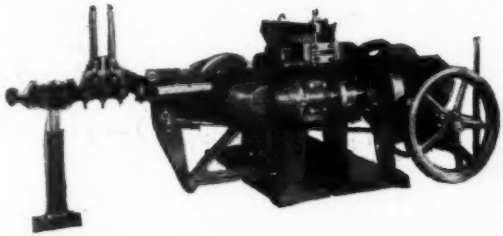
WARTIME SHORT-CUT

New inventions, processes and production short-cuts, perfected during the war, will aid American industry to speed the return to full employment and normal business, according to Nils H. Lou, Glenn L. Martin Co., assistant to the Vice-President, Manufacturing, speaking before the Baltimore Chapter of the ASTE.

By way of illustration, he cited a unique photo-reproduction process developed by Martin in the early stages of the war. Known as "photo-lofting", this process involves use of a specially equipped camera, weighing 10 tons together with its superstructure — probably the largest camera in the world, yet as foolproof in operation as a simple box camera.

TO MEET *Today's* INDUSTRIAL REQUIREMENTS

THE NILSON AUTOMATIC METAL AND WIRE FORMING MACHINE



The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the features of this machine: Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

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Based on the fact that torque and inertia are the fundamental principles of all drilling, reaming and tapping operations, the BUFFALO TORQUE CONTROL COUPLINGS are designed to eliminate drill, tap and reamer breakage by acting as a safeguard between the driving power and the tool.

When adjusted at a fixed torque to perform a particular operation, these couplings automatically throw out when over-loaded, thereby severing the driving power thru the coupling itself, but automatically re-engage and re-assume the driving power when the overload has been removed.

Available in production and utility models, in sizes for all operations on drilling machines, lathes, turret lathes, horizontal boring mills, etc.

Also manufactured as STUD DRIVERS, NUT SETTERS AND TRANSMISSION TYPES.

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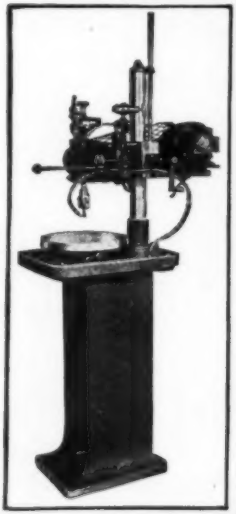


Machine Tool Type
Utility Model

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Precision . . . .

TAPPING



Leads changed in 90 seconds

M & L

PRECISION TAPPER

This is a fast rugged production tool capable of sustained accuracy. Flexible and adaptable, it cuts clean screw threads, handling up to ¾" in non-ferrous metal and 0 to ½" in SAE steel. Class 3 and Class 4 gage fits and high production schedule are accomplished in normal operation even with unskilled help.

Tapping speeds are 95 to 350 rpm with reverse speed twice that of forward speed. Taps are guided by precision ground lead screws which are easily and quickly changed. Bulletin 143 gives full details.

Dealers' inquiries are invited

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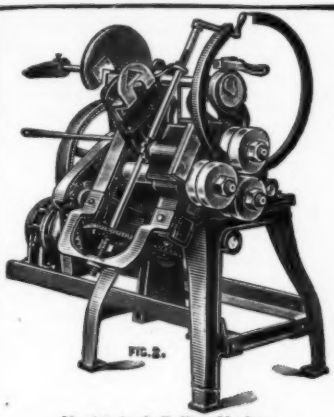


Sawing a template to outlines photographed on template material.

By allowing engineering plans to be photographed on sheet metal with uniform accuracy, Mr. Lou said, it eliminates many steps formerly required in tool-making. Thus it materially reduces the time needed for factory tooling, which must be completed before peacetime production can actually get under way.



Construction of assembly fixtures by mounting locators and clamps directly on photographed layout.



No. 14 Angle Rolling Machine

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CAPACITY—2"x2"x¼" ANGLE

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This picture shows how a RUSNOK head is used to convert an idle surface grinder into a modern milling, drilling, boring machine capable of performing a wide range of high speed, precision operations. Uses many types of cutters on a wide range of work. Easily mounted — tilts to any angle. Large size spindle (No. 9 B & S taper). Takes 1/16" to ¾" end mills. Large quill with 4" travel, counter balanced, hardened and ground. Six speeds 250 to 3000 RPM. Lever and worm feeds. ½ h.p. motor. Specially engineered by RUSNOK to meet modern demands for high speed, high precision, heavy duty end mill operations. Prompt delivery. *Write for illustrated Circular and prices*

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For full information on this NEW, BETTER layout dye, write for free descriptive bulletin.

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6795 E. NINE MILE RD., VAN DYKE, MICH.

Mr. Lou pointed out that the United States' ability to tool rapidly and effectively was a major factor in defeating the Axis, and may now be an equally decisive factor for peace.

"Until the factories, yards and plants, so recently geared for war, have retooled for peace", he said, "the battle will not be fully over, nor the rewards of peace assured."

"Possibly some people who do not know the United States doubt this country's ability to reconvert such a vast industrial network to peacetime production in an orderly manner; just as others were formerly sceptical of its power to deliver sufficient weapons of war in time. We disappointed the sceptics once, and we will do so again . . . The tool engineers of America have one more big job to finish."

The Martin photo-lofting process, Mr. Lou said, can assist tool engineers to accomplish that job with the greatest possible dispatch. While recognizing that many other short cuts and time saving processes have been developed by wartime industry, he said this appears to be only one so generally applicable to tool engineering.

Used by the Boeing, Grumman, Beech and Chrysler Companies, as well as by Martin during the war, photo-lofting made practicable the mass production of very large aircraft, such as the Mars and the B-29 Superfortress. It cut the time required for tooling the B-26 Marauder as much as 100,000 hours and will do the same for the forthcoming commercial transport, Model 202.

Applicable to a variety of fields besides aircraft, it has been used by the Navy in building ships, and may now be used to hasten the delivery of automobiles, washing-machines, refrigerators and many more peacetime products.

TOOL STEEL MANUAL

A 170-page, pocket-size catalog and manual, "The Tool Steels of Allegheny Ludlum," has been released by the Allegheny Ludlum Steel Corp., Brackenridge, Pa. Double the size of preceding editions, the manual provides a complete coverage of tool steels for all uses and users. It contains many pages of technical data and is liberally illustrated. Thumb-indexing and sectional arrangement, plus a full general alphabetical index, make it easy to use.

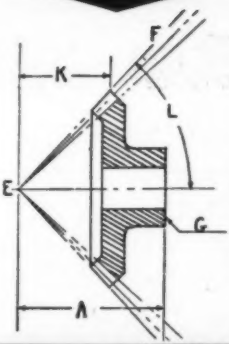
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...and here's the Answer

EASY BEVEL GEAR GAUGING

No Long Calculations

No Involved Set-up



With Herkimer sine bars and bevel-gear gauges, anyone with ordinary gauging experience and ability to read blueprints can quickly and accurately check all important bevel gear dimensions and relations. Production gauging made easy.

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HERKIMER TOOL & MODEL WORKS, 108 King St., Herkimer, N.Y.

HART'S Machine Vise Jaws



These Jaws are useful on any machine table. The angle holding the work down. Suitable to clamp or bolt to table. The hardened tool steel jaw measures 3"x6" ½" thick angle edge serrated.

HART'S Milling Fixtures



These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes —to hold stock from ½ to 5 inches.

HART MACHINE CO.

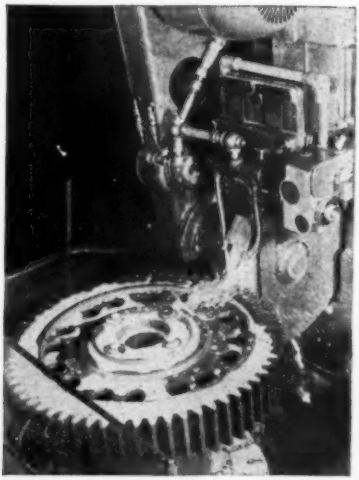
26 MATHER ST., DORCHESTER, BOSTON, MASS.

When writing for descriptive circular kindly mention the BLUE BOOK.

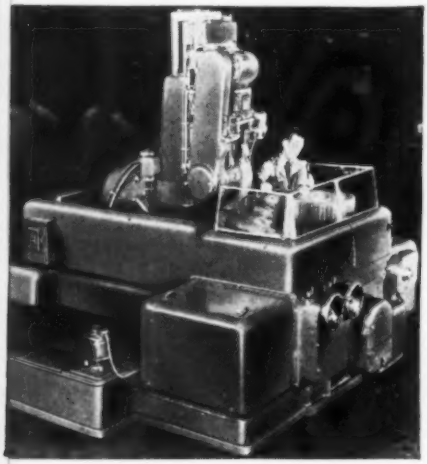
WHAT'S NEW IN METALWORKING

PRATT & WHITNEY 26" UNIVERSAL GEAR GRINDER

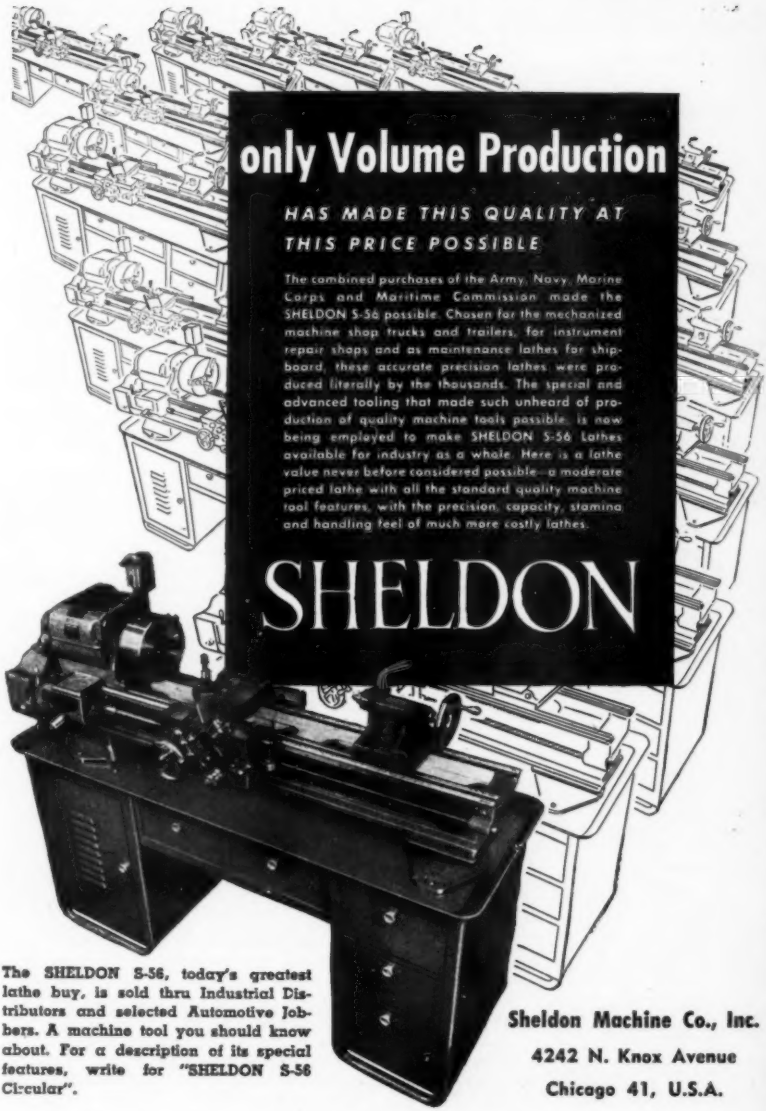
A NEW 26" Universal Hydraulic Vertical Gear Grinder for both spur and helical gears is announced by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn. The new machine is capable of handling gears up to a maximum outside diameter of 30" with a maximum diametrical pitch of 2 and a minimum diametrical pitch of 12. It will handle helix angles, either right or lefthand, up to 35°, and a maximum width of gear face of 10". Indexing means are provided for grinding gears with numbers of teeth ranging from 5 to 190 inclusive, except for a few prime numbers above 83.



The new machine is similar in principle to the 10" Pratt & Whitney Gear Grinder in that both produce involute profiles by rolling the pitch circle of the gear being ground upon an imaginary pitch line. Rolling of the pitch circle is in a direction perpendicular to the gear axis, and with a gear tooth in contact with a V-form grinding wheel, which simulates one tooth of a generating rack. Grinding wheel is mounted on a ram or wheel slide which reciprocates in a direction parallel to the gear axis.



Differing from the horizontal 10" machine, the new 26" Gear Grinder is a vertical machine with a motion most nearly resembling a vertical shaper. It has a vertical work axis, and a vertically moving wheel slide. This arrangement is more convenient for placing large-diameter, heavy gears in machine.



only Volume Production

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The combined purchases of the Army, Navy, Marine Corps and Maritime Commission made the SHELDON S-56 possible. Chosen for the mechanized machine shop trucks and trailers, for instrument repair shops and as maintenance lathes for shipboard, these accurate precision lathes were produced literally by the thousands. The special and advanced tooling that made such unheard of production of quality machine tools possible, is now being employed to make SHELDON S-56 Lathes available for industry as a whole. Here is a lathe value never before considered possible—a moderate priced lathe with all the standard quality machine tool features, with the precision, capacity, stamina and handling feel of much more costly lathes.

SHELDON

The SHELDON S-56, today's greatest lathe buy, is sold thru Industrial Distributors and selected Automotive Jobbers. A machine tool you should know about. For a description of its special features, write for "SHELDON S-56 Circular".

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DRIVE OUT THE "WOBBLIES"
Of Couple Force Action

• Longer life and greater efficiency of all rotating parts is a MUST in post-war product design. Bear Dy-Namic Balancing Machines enable you to get rid of efficiency-destroying WOBBLIES, *faster, easier* and at *lower cost*, both on the products you machine or manufacture, and on your own production machinery. Bear's wide range of models, in all types and sizes, brings *Balanced Precision* to shafts, wheels, gears, blowers, armatures . . . even railroad car wheels . . . all rotating parts from 4 oz. up to 4000 lbs.!



753

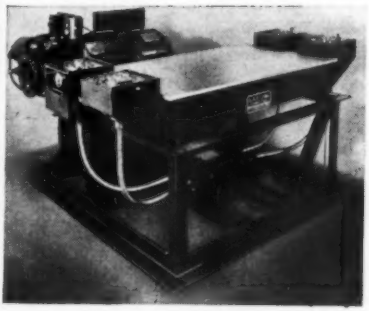
***THE NEW BEAR BULLETIN** brings you the facts about Dy-Namic Balance . . . shows the complete range of Bear Balancers, each especially designed to meet specific balancing problems. Write, wire or phone details of your problems, and send for your copy of the new Bear Bulletin today. Address Bear Mfg. Co., Dept. MMS, Rock Island, Illinois.*

BEAR DY-NAMIC BALANCING MACHINES

The greatest difference between the standard 10" Grinder and the new 26" Gear Grinder is in the mechanism used for producing the rolling generating motion of the gear being ground. Instead of the master rack and master gear method, the new machine uses a system of change gears. Work is mounted on a rotary table and rotated by a worm and wheel. This rotary table is supported on a carriage which is moved in a direction perpendicular to the work axis by means of a screw. The relative rates of motion of the rotary table and the sliding carriage determine the rolling or generating pitch diameter of the work. Change gears connect the pitch screw to the table worm. The change gear ratio can be altered to cover the range of pitches, pitch diameters and tooth numbers. Indexing is obtained thru a one-tooth clutch in the change gear train driving rotary table. During return of the carriage, this clutch withdraws and rotates one or more turns, which alters rotative position of the work. A telltale lamp indicates operation of this one-tooth clutch.

In general, the 26" Gear Grinder is a large and heavy machine to maintain the accuracy it is required to produce. It occupies a floor space 107x135" and weighs approximately 20,000 lbs.

VIBRATION TEST EQUIPMENT

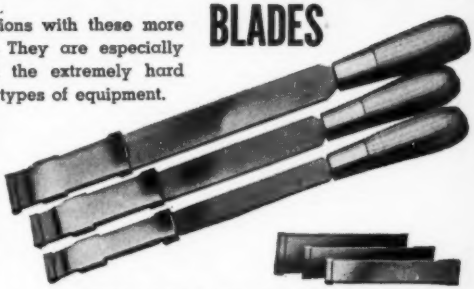


A reaction-type Vibration Test Table used to shake out faults in assemblies and components, is announced by L.A.B. Corp., Summit, N. J. The large table top is supported by four vertical rods acting as flexing columns to permit free table vibration in the two horizontal directions. Four sets of rotating eccentric weights induce rectilinear and pure harmonic vibrations. These weights, mounted on vertical

Anderson CARBOLOY TIPPED SCRAPER BLADES

Speed up your scraping operations with these more efficient, longer lasting blades. They are especially good for hard alloy iron and the extremely hard bronze castings used in various types of equipment.

If you are already using Anderson Hand Scrapers it is not necessary to buy complete new scrapers in order to use carboloy tipped blades. Simply remove the high-speed steel blade and slip in the Anderson Carboloy Tipped Blade. They are available in three widths.



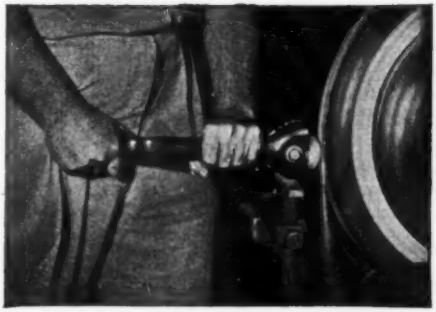
THEY LAST 8 TO 10 TIMES LONGER

Write for Bulletin No. 11-5

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You can increase your grinding production by dressing your wheels regularly with Desmond Dressers.

We manufacture the only complete line of dressers and will be glad to send any of them to you for trial or advise the type and size you should use.

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THE DESMOND-STEPHAN MFG. CO.
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Hundreds of Rouse Hand Millers have been sold to leading manufacturers who have evidenced their satisfaction by repeated orders.

Efficient, versatile, accurate, speedy, the Rouse Hand Miller fits in on finishing operations where light cuts are made in brass, aluminum, steel and other metals.

With Rouse Fixture Set-Ups the Rouse Hand Miller is efficient and economical for accurately milling small parts for planes, radios, electric motors and similar equipment.

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2214 N. Wayne Ave., Chicago 14, Illinois

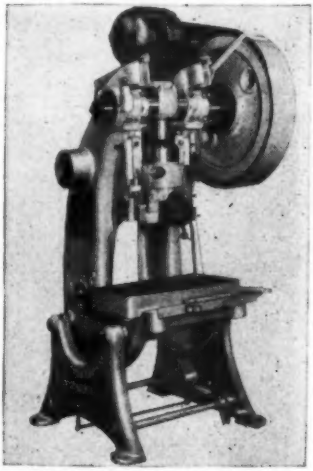
shafts, are driven by a variable speed drive thru a synchronizing gear box and flexible shafts.

The amplitude (⅛" maximum excursion at 100 lbs table load) and direction of vibration (horizontal crosswise or lengthwise) are adjustable when machine is not running. Increase in load over 100 lbs. automatically reduces amplitude.

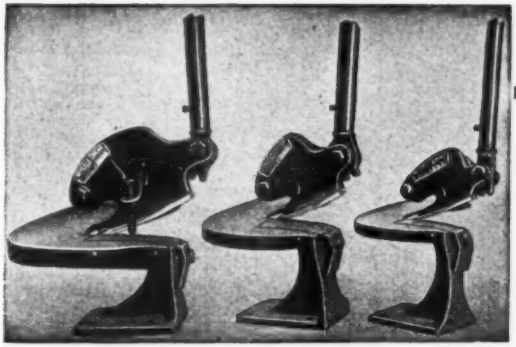
Standard frequency range is 10 to 60 cycles per second, which is adjustable while running, either by hand wheel or ¼ hp motor-driven automatic frequency change control, with one minute complete cycle. Amplitude does not vary with frequency. An acceleration of 10 Gs is produced between 50 and 60 cycles per second at ⅛" double amplitude.

The equipment, which has a maximum capacity of 400 lbs., weighs 1500 lbs. and is operated by a 5 hp motor. It utilizes small space, overall dimensions being 52x58x32" high. Table top is 24x40¾". Installations can be made on upper floors of buildings without concrete bases.

WALSH COMPLETES PRESS LINE



The Walsh Press & Die Division of American Machine & Gage Co., 4743 W. Kinzie St., Chicago, announces a complete new line of punch presses, ranging in size from 6 to 80 tons capacity. All sizes feature carefully ground forged steel crank shafts, hand scraped bearings, solid web wheels and gears; ready inclinability, an



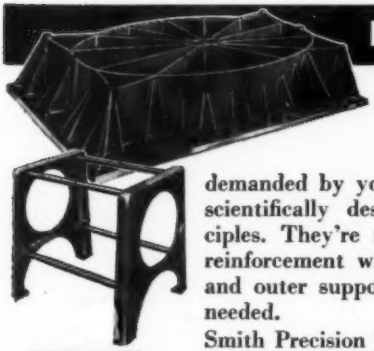
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If you're cutting STRAIGHTS or IRREGULARS, you can shear it cleverly with a BEVERLY Bench-Type Shear. Order No. 1 for 14 Ga., No. 2 for 10 Ga., No. 3 for 3/16" mild steel and 10 ga., stainless. Write today!

THE BEVERLY SHEAR MFG. CO., 3005 W. 110th Pl., Chicago 43, Ill.

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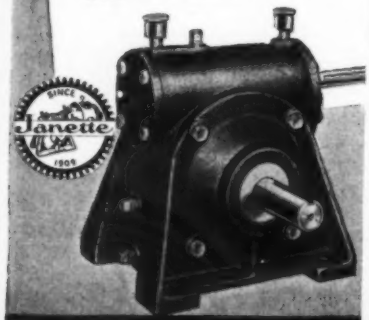
Smith Precision Plates . . . both Surface and Lapping Plates are built to give the kind of rugged service demanded by your jobs. Smith Precision Plates are scientifically designed on sound engineering principles. They're rigid . . . their large elliptical rib reinforcement with internal network of spider ribs, and outer supporting ribs, puts strength where it's needed.

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For SLOW SPEED DRIVES
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The World Wide Reputation of Janette Electrical Machinery for reliable performance is, we believe, the equal of any company, large or small.
FOR THE MOST VITAL and IMPORTANT INSTALLATIONS You Can Safely RELY ON JANETTE SPEED REDUCERS!
Ask for BULLETIN 22-27


Janette Manufacturing Company
556 W. Monroe St. Chicago 6, Ill.

adjustable die head, smooth, high speed operation, and a simple yet highly efficient two button safety device for protection of operators.

The No. 5½ Press shown features forged alloy crankshaft, hardened and ground; slide and gibs scraped to .002" alignment; clutch parts hardened and ground and a 2-button safety and non-repeating device.

Descriptive bulletin No. 1045 gives specifications on this new line of power presses.

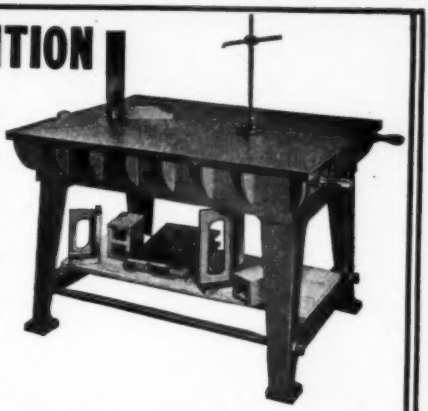
DEFIANCE MOLDING PRESS



A plastic transfer molding press, No. 152, is announced by Defiance Machine Works, Inc., Defiance, O. This press has a box type, well-ribbed, cast steel head or upper platen, heat-treated alloy steel tie rods and heavily ribbed and well-distributed mold supports. Cylinders are cast of special close grained metal ground and honed. Maximum working pressure of 3000 lbs psi exerts a mold clamping pressure of 170 tons thru the main ram, diameter 12". A transfer pressure of 42 tons (at 3,000 lb. psi.) is exerted thru the transfer cylinder, diameter 6".

Maximum mold width is 18", length 26", minimum working space or "daylight" between platens is 15", which can be in-

A USEFUL ADDITION



Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*

J. C. BUSCH COMPANY ENGINEERS AND MACHINISTS SINCE 1907

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JOHNSON Furnaces

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Bench Type

Designed primarily for high-speed steels, this powerful JOHNSON No. 120 Hi-Speed Bench Furnace is equally efficient for heat-treating ANY carbon steel tools, dies, or small metal parts. Reaches desired operating temperature FAST to get the job done quickly and economically. Easily and accurately regulated. Firebox 3 x 7¾ x 13½ lined with high temperature insulating refractory. Furnished complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

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570 E. Ave. N.W., Cedar Rapids, Iowa
Please send me Hi-Speed Furnace Literature

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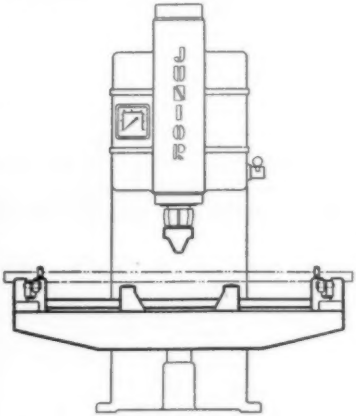
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creased in 2" increments up to 23". Platen stroke is 15". With upper platen in highest adjustment, minimum height of mold is 13½"; with upper platen at lowest adjustment, minimum mold height is 5½". Pots and plungers can be supplied in four different bore diameters.

COLONIAL STRAIGHTENING FIXTURE

Increased flexibility of use has been provided on its "Junior" hydraulic broaching and assembly presses by Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich. thru additional equipment enabling the press to be used interchangeably for straightening operations.

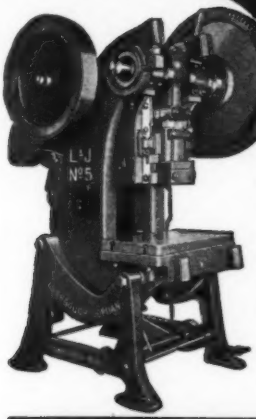


The changeover from assembly or broaching jobs to straightening work is accomplished simply by placing on platen of machine a self-contained single-unit roller type straightening fixture, as shown. This fixture extends out beyond platen to left and right in order to provide ample support for work pieces considerably longer than width of the standard machine platen. In general, the machines will be found most useful for straightening work on small diameter parts.

The straightening fixtures are available for all sizes of Colonial "Junior" presses, ranging from one to four tons' capacity. They may be used either on the bench type model or on the base type "Juniors". Machine operation is hydraulic, with infinitely variable (within capacity of machine) ram speed and pressure controls available if desired.

Standard Since 1911

L&J



INCLINABLE POWER PRESSES

5 to 79 tons

NO. 5 BACK GEARED TYPE

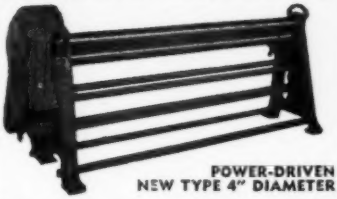
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successors to Lushbaugh-Jordan Tool & Machine Co.

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LOWN SLIP ROLL FORMING MACHINES



POWER-DRIVEN
NEW TYPE 4" DIAMETER

A sturdy, heavy-duty former with rolls of tough steel, turned and polished. Supplied complete with motor and drum type reversing switch. Sizes range from 36" to 98" roll length. All three rolls may be power driven if desired. Heavier and lighter machines also available. Write for details.

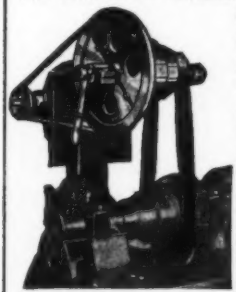
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Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

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GALLMEYER & LIVINGSTON TOOL AND CUTTER GRINDER

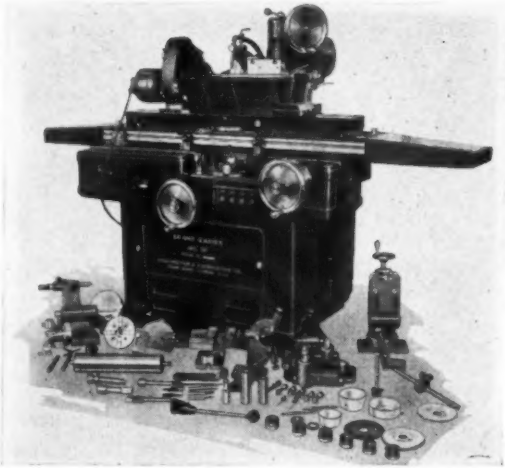
A new Hydraulic Feed Universal Tool and Cutter Grinder (No. 80) is announced by Gallmeyer & Livingston Co., 405 Straight Ave., S.W., Grand Rapids 4, Mich.

The No. 70 and the No. 80 Grinders are identical except that the size of table of the No. 80 Machine is 6"x50", and the amount of longitudinal table movement 32", while the No. 70 Machine is equipped with a 6"x42" table and has 24" of longitudinal table movement.

These are heavy, rugged, machines with hydraulic longitudinal table movement which provides for an unlimited number of table speeds ranging from 4" to 50' per minute.

The hydraulic mechanism and driving motor are completely housed within base.

Speed of the longitudi-



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nal table movement is controlled by a lever conveniently located on front of Grinder.

Table runs on ball bearings carried in a micarta retainer on carbon steel ways with hardened and ground tool steel inserts. This guarantees ease of movement thru conveniently located hand wheel for the many jobs on which the hydraulic table movement cannot be used advantageously.

Machine is equipped with a "greased-for-life" precision cartridge type ball bearing spindle requiring no lubrication for life of the bearings. A Bijur system provides lubrication of machine proper.

A four-speed motor drive headstock providing for work speeds of 80, 160, 260, and 525 rpm is standard equipment.

Magnetic starters are housed in a compartment in side of the column with separate push buttons placed in a control panel conveniently located on front of Grinder.

A 24-page Bulletin GL-8-45 featuring this machine is available. It shows large scale illustrations of the machine and equipment, including many attachments and accessories.

BARRETT PORTABLE LATHE



Barrett Equipment Co., 21st and Cass Ave., St. Louis 6, Mo., offers a portable Brake Drum Lathe which greatly increases its adaptability for field service work, or in locations where time and labor can be conserved by bringing the lathe directly to the job.



THE HILLIARD
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A new type of safety clutch which releases completely and instantly when overloaded. Positive in action – accurately adjustable – they furnish absolute protection. Their rugged construction – simple design with few parts – means long trouble-free life.



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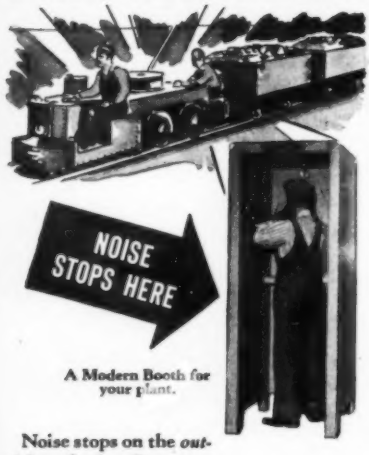
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● "Double the speed of our former gages." "10 million pieces without a rejection." "Low fatigue factor... fewer errors by inexperienced operators because they can SEE the big indicator so clearly." "Extremely accurate."

Users back up these reports with re-orders for scores and even hundreds of additional TRICO MICRO-CHEKS, the modern precision comparator gage of a thousand-and-one uses. Send for booklet which illustrates many applications.

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Noise stops on the *outside* of the Burgess Acousti-Booth... thick walls of sound-absorbing material soak up distracting sounds. Inside the Burgess Booth all's quiet... conversations are clear... understandable. The noise of the factory machine simply fades away.

The Burgess Acousti-Booth has no door ...air and light are plentiful. There's even a handy shelf for taking notes. Easy to maintain... easy to keep clean... extremely sanitary.

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Please send illustrated booklet describing the Burgess Acousti-Booth.

NAME .....

FIRM NAME .....

STREET-CITY .....

Outer end of lathe shaft rests on an easily adjusted steady-rest to prevent off-center deflection of shaft because of weight of the object being machined. Lathe on its adjustable stand, together with the steadyrest, are arranged on a well balanced, rubber-tired wheeled track to permit easy handling. When track is placed on the floor, the 6" diameter x 1½" wheels are raised from contact, thus giving firm support for lathe and its work. Floor and track arrangement, not lathe shaft, support the weight.

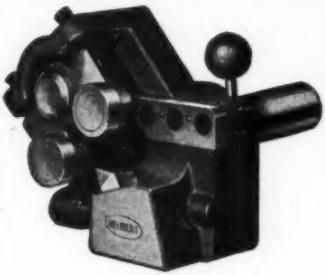
Built on the principle of the internal boring bar, the lathe has a range of swing from 7" to 24", is equipped with rheostat speed control, operates on any 110V a-c or d-c outlet, and has adequate power to handle the largest and heaviest brake drums.

Altho designed primarily for automotive use, the Lathe will be found fast and economical in many industrial plants.



Checking a thread gauge smaller than a thumb nail is relatively simple when this comparator at the East Pittsburgh Works of Westinghouse is used. By a system of mirrors, the gauge has been enlarged 100 times to facilitate study of its contours for absolute accuracy. This and other delicate measuring instruments, located in a specially designed laboratory in which the air temperature is held at 68° F the year around, and the humidity is also held constant, enable engineers to maintain tolerances as close as 2/1,000,000". In addition, a Precipitron electrostatic air cleaner, is used in the air intake duct of the laboratory to eliminate dust from the shop.

THE NEUBERT BAR TURNER



1"

Write for circular.

IS THE BEST TIME SAVING TOOL USED ON TURRET LATHES AND SCREW MACHINES SET UP FOR BAR WORK. REMOVES LARGE AMOUNTS OF METAL QUICKLY AND PRODUCES WORK THAT IS SMOOTH AND ACCURATE.

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3/16 to 1" capacity, flange type	85.00
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NEUBERT MACHINE COMPANY

Precision Cutting Tools — 341 W. Willow, Long Beach 6, Calif.

GUILD *Reamers*

HALLMARK OF *Precision* IN THE MANUFACTURE OF *Special Reamers*



HIGH SPEED STEEL — *in sizes from .030 diam.*

CARBIDE TIPPED — *in sizes from .200 diam.*

STRAIGHT • SPIRAL • STEP • PILOT • HAND

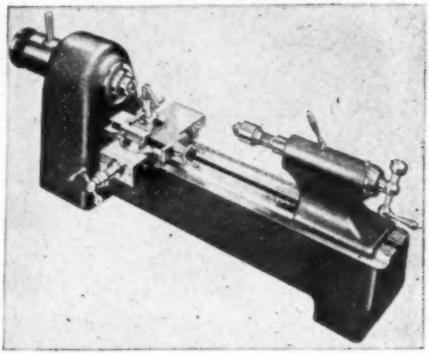
● GUILD is the new name for an old established line of reamers whose reputation for accuracy has become outstanding in the manufacture of aircraft—motors—engines—small arms—radios—fine instruments, etc. The name GUILD is stamped on each individual reamer as an identification—a hallmark of finest quality. Quality that is possible only by *creative* and *productive* ability far above the average in the manufacture of *reamers specially built for special purposes.* Write for booklet.

METAL CUTTING TOOLS
AND MANUFACTURING CO.
11121 Grand River Ave., Detroit 4, Mich.
• HOgarth 9164-5 •

What STERLING *is to silver* GUILD *is to Reamers*

GILMAN JEWELERS—INSTRUMENT LATHES

The New Gilman Jewelers-Instrument Lathes should be of particular interest to those manufacturers requiring extreme accuracy and high finishes, combined with quantity requirements in small parts fabrication. For toolroom or production, it is made by Gilman Engineering Works, Janesville, Wis.



For production, the six-position, self-indexing, tilted turret, plus the double-tool post, lever operated cross slide provide for many applications. The precision ball bearing spindle, completely enclosed headstock and the lever-operated collet closer, which is incorporated in the spindle housing, all compactly designed, add much to appearance and have proven successful in production use.

The Gilman, Model 4-123, provides the hand-wheel collet closer only, therefore, its use is more fitted for toolrooms. The conventional compound and tailstock use Acme ground screws and are available in metric or English system.

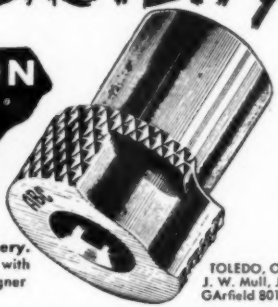
The lathe bed is rigidly designed to provide suitable support for all accessories.

Swing over bed is 5⅝"; over cross slide 2⅝"; maximum collet accommodation is .315"; distance between centers 5"; available with variable speed drive and bracket; spindle speeds are from 600 to 5,000 rpm. Model 4-124 is 21" long over all, with lever-operated collet closer.

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With Speed-up and Lowered Costs

A. S. A. STANDARD PRECISION DRILL JIG BUSHINGS



Standard sizes and styles in stock for prompt delivery.
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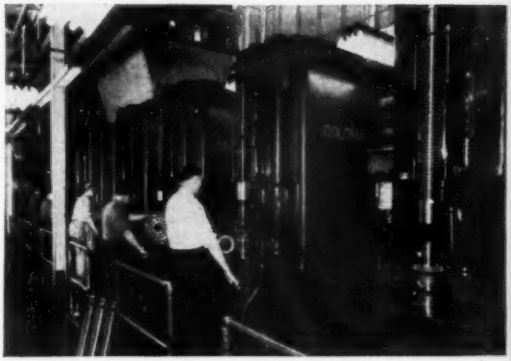
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The machines are all 30 ton types, with overload up to 84,000 lbs per machine.

JIGMIL BULLETIN

The DeVlieg Machine Co., 450 Fair Ave., Ferndale, Mich., now have available for distribution an eight-page bulletin describing the new model 3-B Jigmill. According to the makers, this new type boring and milling machine introduces auto-

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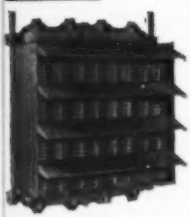
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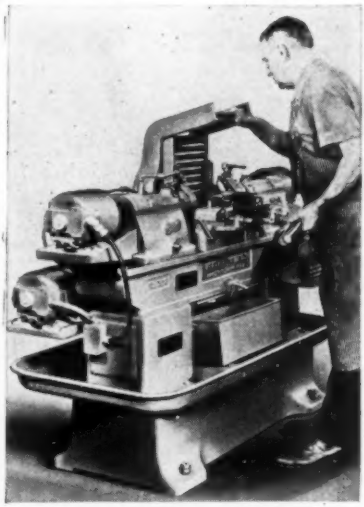
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matic positioning and "accuracy beyond human skill" with unique push button controls. All bar functions can be performed with the operator's continual visual attention to the cutting tool.

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Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn. offers a new 1¼"x18" Full Automatic Centering Machine capable of producing accurate, properly centralized and lined-up center holes simultaneously in each end of a piece of stock. Except for initial setup, machine can be handled by unskilled labor.



Both ends of work are centered in one operation with drills being fed in conjunction with a full automatic work handling mechanism. Drills are withdrawn twice during operation, to clear out chips and permit oil to enter drilled holes. Cam path controlling this feed is arranged in three steps so that after each withdrawal, center drills go in to a greater depth—reaching full depth at last advance. The two drill spindles are mounted in preloaded ball bearings inside quills, which, in turn, are actuated by a rack and pinion feed thru spring resilient levers. Both drill heads can be adjusted on bed to any desired position

Extreme Convenience of Operation
In drilling holes from .004" to .250" dia.

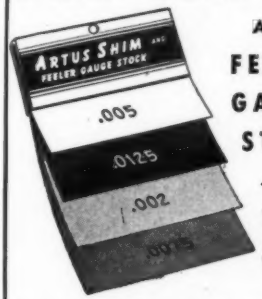
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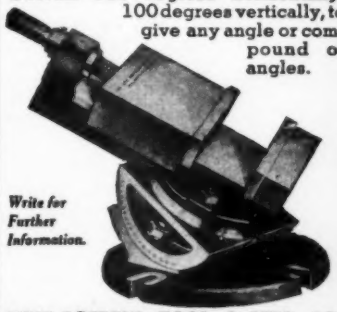
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$125.00 F. O. B. Milwaukee **COMPLETE with MOTOR and SAW ATTACHMENT**

$118.50 without Saw Overarm. For machines without motor, deduct $8.50 from these prices.

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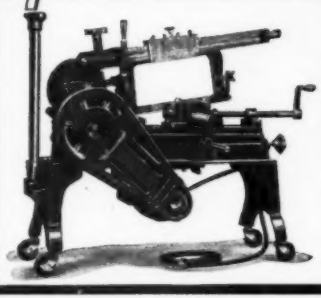
and then positively clamped. Each is driven by a ½ hp foot-mounted motor which permits easy motor replacement. Oil is supplied continuously to drills from a gear pump, and surplus oil drains to a tank underneath.

Magazine holds work and allows it to feed down by gravity to transfer slides. Magazine ways have adjustable guides to accommodate work ranging from ¾" to 1⅜" diameter. It may be set to accommodate a range of work varying from a minimum length of 3½" to a maximum length of 18". Transfer slides carry work forward from magazine, one piece at a time, to the centering drills, and hold it in correct position for accurate centering. Transfer plates on slides remain in contact all during centering operation. These transfer plates hold work in the V blocks, and they are actuated thru adjustable toggle levers from a cam—thus obtaining rigid clamping. Transfer slide can be adjusted for any necessary length of stroke. A compensating arrangement on the V jaws automatically takes care of small variations in work diameter. These jaws also may be adjusted to drill holes out of center on one or both ends, such as short oil holes, or holes for driving pins used in grinding. Work transfer slides, magazine uprights and work holding V blocks all are mounted on bases which can be adjusted to any desired position on bed, and clamped positively in position. The entire automatic mechanism on rear of bed is driven by a ½ hp foot-mounted motor. A crank is provided for conveniently moving entire mechanism by hand during setting-up operation. Machine is equipped with pushbutton control convenient to operator's right hand.

Length of stroke of drill spindle can be varied from ⅜" to 1¼", and maximum countersink diameter is ⅝". Stops are provided to limit forward movements of drill spindles. These stops meet either of two conditions:—They can be set to bear against end of work, and so hold centering depth to a predetermined dimension; or can be reversed so they engage lugs on drill head casting. This limits forward movement of spindles and brings center holes the same distance apart, regardless of variations in length of work.

Machine is supplied with change gears which provide four different camshaft speeds of 2.9, 4.3, 6.1 and 9 cycles per minute. Two sets of collets, 3/10" and 7/16", are provided—while other sizes are available on special order. Machine occupies a floor space 72"x34" and is 54" high. It weighs approximately 2,000 lbs.

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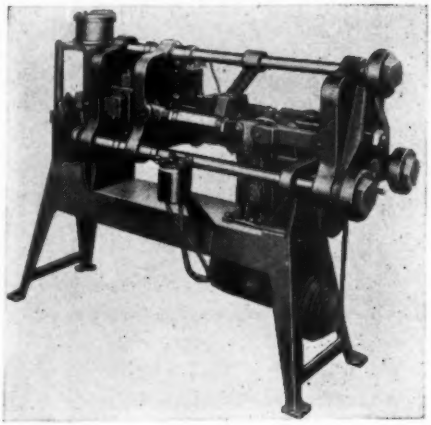
Sands, deburrs, finishes any irregular or flat surface...quickly and effortlessly. The Sand-O-Flex is a brush-backed sander that produces finest results on the most difficult jobs. Available to fit either ½" or ⅜" stationary or flexible motor shaft. Approx. weight, 2¾ lbs. fully loaded. Uses any abrasive. By changing the grit, it can be adapted to hundreds of uses. See your dealer or write.

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4373 Melrose Avenue Hollywood 27, Calif

LIGHT METAL DIE CASTING MACHINE

A low-priced die casting machine for the production of small zinc, tin and lead alloys, claimed to operate on a different principle, is being built by Light Metal Machinery, Inc., 607A Ariel Bldg., Erie, Pa.



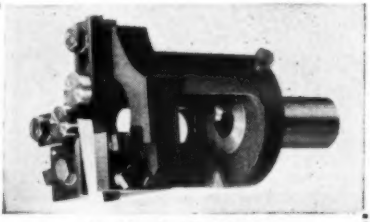
Casting cycle is completely automatic, with die movement, injection and ejection is actuated by one extremely simple mechanism.

There are four operating speeds—266, 400, 639 and 882 shots per hour. Because of these high cycling speeds, it is said that castings can be made in a single cavity die at production rates equal or superior to those of large machines. This means that, without sacrificing speed of production, die cost can be cut from 50 to 90 percent. In the casting of small parts, however, multiple-cavity dies have proved quite practical, as evidenced by the fact that a number of jobs are being run successfully on four- and eight-cavity dies.

Small, light-weight dies are easily installed and removed, reducing die-change time to a new low:—15 minutes per die change, using average dies.

It is emphasized that cost and time consumed in repairs and other main-

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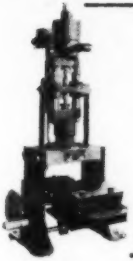
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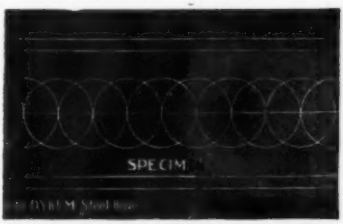


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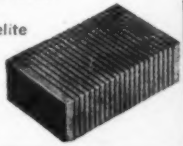


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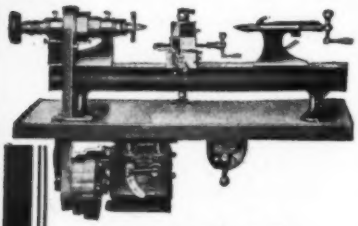
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Originators of the American Bench Lathe

tenance are very low, for two reasons:—(a) the actuating mechanism is simple and involves little wear-and-tear upon parts of the machine; (b) entire machine is simply designed, and almost any part may be removed from it in approximately 15 minutes.

Like many other parts, the pressure pot assembly can be removed and replaced in 15 to 20 minutes. Injection plunger and cylinder assembly should last 300,000 shots before regrinding, and has, in some cases, lasted 1,000,000 shots between grinds.

It is possible with the new machine to make castings of superior quality, greater uniformity and dimensional accuracy, with extremely low reject rates. This is due to (a) single-cavity dies, where there is no possibility of variance between cavities, and (b) exact duplication of casting conditions (metal heat, die heat, cycle time, dwell, etc.) at all times, resulting from automatic operation and consequent elimination of variables in the casting cycle.

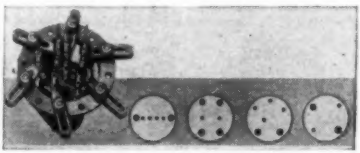
Machine is small and compact and can be operated in a space of 100 square feet.

It operates with either air or hydraulic pressure on the injection plunger. On the standard model, plunger diameter is 2"; stroke is 4"; shot capacity is 18 ounces; casting area is 30 square inches, and injection pressure is 1000 psi if an air cylinder is used, or 2000 psi with a hydraulic cylinder. Other plunger sizes are available.

Machine is 6 feet long, 21" wide, 4'6" high, and weighs 3000 pounds.

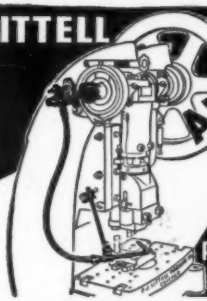
ADJUSTABLE MULTI-DRILLS

Commander Mfg. Co., 4227 West Kinzie St., Chicago 24, announces the Multi-Drill, a new six-spindle, universally adjustable multiple-spindle drilling attachment.



This new attachment can be easily and quickly installed on most types of drill presses. It comprises a driving head with six movable spindles, each of which is located by an individual radially adjustable arm. This design readily permits the

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AIR-BLAST VALVES

SAFER
FASTER
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LITTELL Air-Blast Valve automatically ejects pieces from punch presses. Keeps operator's hand out of danger zone. Increases safety and speed. Air nozzle quickly adjustable.

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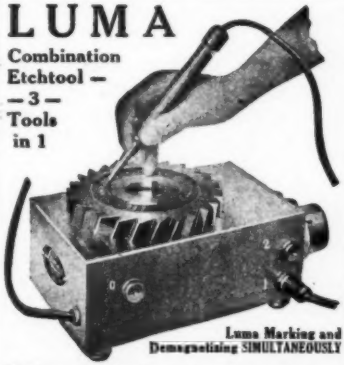
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Long "Open-window-type" slider out of one solid piece of toolsteel. No rivets, no cross members.

Base and Slider of Height Gages rust-proofed by attractive deep penetration—Black Magic Finish.

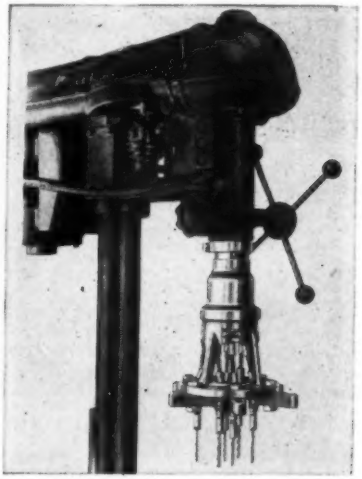
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positioning of drills up to 17/64" diameter in any hole pattern, including a straight line, within a 5" diameter circle with minimum distance between centers of 11/16". From one to six holes can thus be drilled simultaneously in one stroke of the drill press.



The housing for drive gears, and the supporting frame and adapters, are of special high strength aluminum alloy. The entire attachment weighs only 13 pounds. Modifications of this attachment are obtainable for special applications.

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The Bemisine Angle Dresser, a new device for dressing precise angles on Surface Grinder wheels, is announced by Nichols-Morris Corp., 50 Church St., New York 7, N. Y.

A precision-fitted sliding member carrying a diamond dressing tool is mounted on an adjustable sine-angle plate which locates on magnetic chuck directly below grinding wheel, as shown.

A novel application of the familiar sine-bar principle is used in tilting sine plate precisely to the desired angle. Ordinary 2" Micrometers are the only measuring instruments required to set any dressing angle from 0 to 90° to accuracy within one minute (1') of arc in a minute's time.



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Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die set that is unsurpassed. Let us prove it!

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CLOSED — OPEN

TRADE **AUTOM** MARK

Plain Type — **Offset Type**

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET.

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CHICAGO

SPECIFICATIONS:
Open Width 1/8" to 6"
Gage Material .040 to .125
Pin Diameter .101 to 3/8
Lengths to 120"

SEMI-OFFSET

THREAD-ALL Tapper



PRECISION TAPPING !! LICKED !!

By Converting Any Drill Press into a Precision Tapping Machine.

Check these advantages:

Handles small taps without fear of breakage. Takes sizes up to 1½" with ease.

Gives precision tapping without need of lead screws.

Electro-magnetically controlled positive depth setting.

No adjustments required for tap sizes.

Silent forward and automatic high speed reverse action.

Taps right or left hand without adjustment.

Machine may be used for drilling, reaming, counterboring, etc. without adjustment.

Write for full details.

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10039 Marcus Ave. Detroit, Mich.



After the desired angle is determined, diamond tool is brought in contact with the wheel and the slide is moved back and forth manually to generate a corresponding angle on wheel. When not required for angle dressing, the sliding attachment can be quickly removed from the Sine-Angle Plate leaving a working surface prepared for holding small parts at accurate angles for grinding, milling, or jig-boring operations. In this manner the tool serves a double purpose. Descriptive bulletin mailed on request.

MULTI-RIB DIAMOND DRESSER



Many single-point thread grinders can now be converted to multi-ribbed wheel work by means of the new Semi-Automatic Diamond Dresser made by the Sheffield Corp., Dayton, O. The advantage

SEND US YOUR PRINTS FOR Quotations

THREAD GRINDING

Also Internal, External and surface grinding.

BROACHING

SCREW MACHINE PRODUCTS

MAGNETIC INSPECTION

• GEARS •

SPUR WORM

BEVEL HELICAL

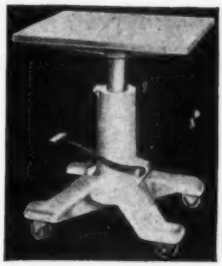
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MANUFACTURERS OF

AVIATION & AUTOMOTIVE PARTS

Gear Specialists

1917 EAST 81st ST. • CLEVELAND 3, OHIO



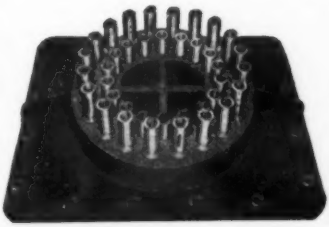
SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½" by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

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MIDWEST TOOL & ENG. CO.

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Pictured: a 38-Spindle Heavy-Duty Drill Head.

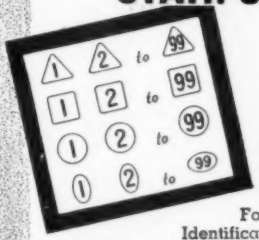
DESIGNERS AND MANUFACTURERS OF MULTIPLE DRILLING EQUIPMENT

We invite your inquiry.

MICHIGAN DRILL HEAD CO.

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New STEEL INSPECTOR'S STAMPS



Faster Identification of Inspectors or Operators. Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.

NEW METHOD STEEL STAMPS, Inc.

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FROM STOCK
GREAVES-SILENT BAKELITE GEARS



No waiting when you order Greaves Silent Bakelite Gears. • We have them in stock NOW! • Your order will go forward immediately. • You'll appreciate the silent operation and added smoothness provided by Greaves Silent Bakelite Gears. • You'll marvel at their great strength to carry big power loads . . . their remarkable ability to successfully operate completely submerged in water. • You'll welcome their low cost. • No metal reinforcements required. • Save Time . . . Money . . . Labor!

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Grinder

GREATER PRODUCTION CAPACITY



Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment. One 60 and one 100 grit 7" dia. steel backed silicon carbide wheels. Ideal for metal bonded or Resinoid bonded diamond wheels.

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MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

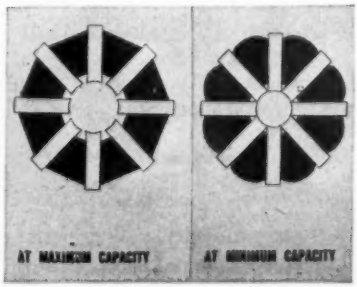
of having more than one rib on a grinding wheel has long been recognized. In single point or single rib grinding, the one rib must bear the entire load, whereas the load is divided among all the ribs of the multi-grooved wheel. Therefore, the ribs retain their form longer, less frequent wheel dressing is required and more parts can be produced per dressing.

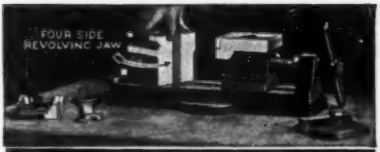
The Sheffield Semi-Automatic Diamond Dresser is mounted between centers of the grinder and is actuated by driving pin on the face plate. A precision ground cam for the required pitch is mounted upon an accurately ground and lapped spindle and controls movement of a suitable diamond. Reciprocating movement of the diamond in conjunction with the uniform lateral motion imparted by the leadscrew results in the desired wheel profiling action.

This precision dressing device is recommended for use on:—(a) Work demanding long lengths of thread and where the breakdown of a single point wheel necessitates making a number of passes; (b) thread gage grinding for elimination of thick first and last threads; (c) Maintenance of minimum lead variation; (d) all fine pitch threads over 32 TPI; (e) Where the wheel is to be dressed at the required helix angle; and (f) where it is desired to traverse grind and the sharp corner and small radii exceed the limits of crush dressing.

A NEW JACOBS CHUCK

A radically new type of heavy duty drill chuck, in which a tough web of neoprene synthetic rubber keeps the jaws in better alignment and permits one chuck to take a wider range of drill sizes, has been developed by The Jacobs Mfg. Co., Hartford, Conn.





SAVES LABOR

You will eliminate many costly hours from your Payroll by using the JACKSON TIME-SAVING VISE. It saves the time wasted by your Machinists in hunting for Bolts, Clamps, Angle Plates, etc., when rigging up work on the Drill Press, Miller, etc. Of still greater importance is the saving in output you effect by not having your productive machine standing idle during the rigging up process, for the —

JACKSON TIME SAVING VISE

by means of its revolving jaws and supplementary jaws instantly holds the thousand and one shapes that arise in machine work.

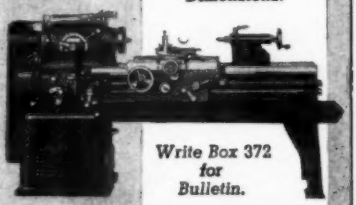
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126 N. THIRD ST. READING, PA.

CARROLL AND JAMIESON LATHES 15" AND 16"

12 Speed Geared Head Motor Drive Timken Mounted Spindle.

Modern Design— Liberal Dimensions.



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THE CARROLL & JAMIESON MACHINE TOOL CO.
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- Deeper impression with less exertion
- Will not spall, will not mushroom
- 25% to 50% more service
- Any size character from 1/16" to 1"

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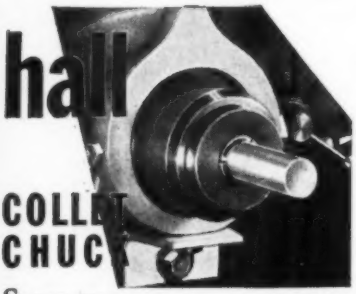
M. E. CUNNINGHAM CO.
SAFETY STEEL STAMPS
228 E. Carson St., Pittsburgh 19, Pa.



STOPS CHATTER "These drivers on the H. P. Rotor absolutely did away with all vibrations and smoothed out all cuts. We then changed to the Cruiser Rotor and used a 1" square nose tool without any trouble, something we cannot do with the solid drive. I believe a lot of tool breakage will be avoided." . . . memo from one of America's largest manufacturers.

Drafto Vibra-Drive interposes an absorbent cushion, takes up tool and gear train vibrations. Five sizes for swings up to 72".

GREENLEAF CORPORATION
Pittsburgh 21, Pa., Dept. B

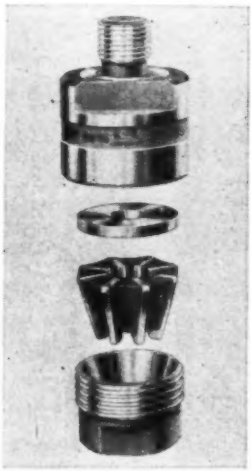


SPEED UP production in multiple operations with push-out type Hall Collet Chuck. Full spindle capacity or over. Tremendous grip over or under stock size to .007—without adjustments...no bearings, friction, heat or loss of power. Instant release without stopping lathe.

Two-inch capacity, now only $145
One-inch capacity, $95
Round, square or hex collets, plain—serrated

HALL MANUFACTURING COMPANY
622 Tularosa Drive • Los Angeles 26, Calif.

In its function, the resilient material replaces the flexible spring steel collet shank of the traditional single purpose type of drill chuck. The rubber is bonded to the steel jaws and passes thru anchoring holes in them, a design which makes the collet or inner socket of the chuck a compact, conical unit. The "Rubber-Flex Collet", as it has been named, is tightened by a screw mechanism which forces it forward into the smooth funnel-shaped nose of the chuck. As soon as the chuck is loosened, for changing drills, the neoprene web pushes the jaws apart and releases the drill shank.

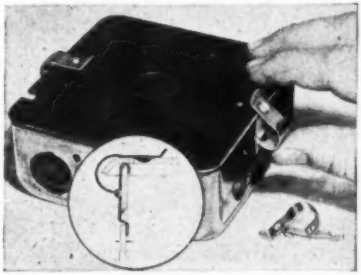


Arthur M. Stoner, inventor of the new chuck and Vice President of the Jacobs concern, which has been making equipment of this type for many years, explained that in development of the "Rubber-Flex Collet" a number of elastic materials were tried. A compound of Du Pont neoprene was finally selected because of its oil-resistance, its low degree of permanent deformation or set (important in keeping the jaws in line) and its all-around toughness.

All working faces of the hardened alloy steel jaws are precision ground after assembly in the neoprene matrix. Because the jaws are always parallel they maintain full-length contact with the drill shank, thus providing much more grip-

ping area than in conventional collets and making for unusual accuracy. The design is such that, in use, the collet is self-tightening, with a toggle-like action.

BOX COVER FASTENER



This ingenious spring steel fastener for box covers eliminates all screws, nuts and rivets, as well as tools for attaching. The clip is self-retaining and need only be snapped by hand into pre-punched holes in sides of box. It is low in cost, light in weight and installed quickly. By merely flipping clips into locked position, cover is held firmly in place as shown. To remove cover, the clips are unsnapped by merely pushing them back with the thumb. These new clips are entirely outside box, with nothing inside to obstruct or damage wires or other equipment.

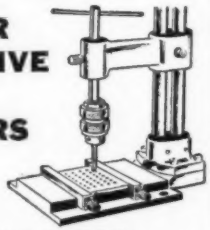
Available for use on sheet metal, die cast, plastic or plywood boxes of varying wall thicknesses. When writing for samples, advise (1) material and (2) thickness of box and cover (3) whether loose-fitting or close-fitting cover. Tinnerman Products, Inc., 2107 Fulton Rd., Cleveland 13, O., is the manufacturer.

TESTS BALL BEARINGS

A production instrument for the testing of completed ball bearings is described in the first issue of a new Quality Control Bulletin published by Physicists Research Co., 343 S. Main St., Ann Arbor, Mich.

The instrument known as the Anderometer enables the production checking of complete ball bearings for deviations of both balls and races from true circularity. Bearing manufacturers using the Anderometer report that several thousand bearings per day can be checked on it.

BERGER SENSITIVE HAND TAPPERS



Two Sizes 0-¼" and 5/32"-½" (or 11/16")

Precision-built Tapping Fixtures for tool room and limited production work. One tap chuck only takes care of entire tapping or reaming range. Lapped spindle and long guide bushing assures perfect alignment at any tap position, prevents bell-mouthed holes, eliminates tap breakage and guarantees square thread axis and perfect thread fit. ½" Tapper comes with ratchet in head.

TOOL SPECIALTIES CO.
RAYMOND-COMMERCE BLDG.
NEWARK 2, N. J.

HAMILTON
SWISS TYPE
GEAR HOBBERS
... for Accuracy and speed in hobbing PINIONS GEARS and SECTORS



TWO MODELS

No. 00 SPUR GEAR HOBBER (Illustrated) for work up to 2" diam.

No. 1 SPUR and SPIRAL GEAR HOBBER for work up to 6" diam.

Write for further details to

TRIPLEX MACHINE TOOL CORP.
Sales Agents
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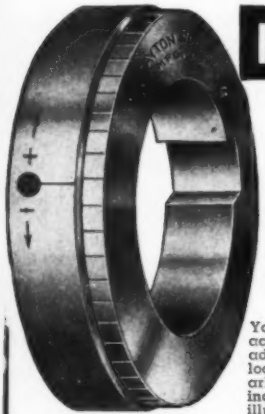
Manufactured by
The Hamilton Tool Co.
Hamilton, Ohio

TEST SPEED CONTROL

In testing metals, plastics and woods many specifications require that the loads be applied at certain and exact speeds. To date this control has been difficult to obtain as no simple, fully automatic and satisfactory pacing device has been available. To fill this important need as engineers and designers work in preparing their new products, often with new materials, the Southwark Division of the Baldwin Locomotive Works, Philadelphia 42, Pa., has developed the Southwark Ram Pacer.

The new device, which attaches to a standard hydraulic testing machine, gives control over the crosshead movement at eight preset speeds, .01, .02, .05, 0.1, 0.2, 0.4, 0.5 and 1.0" per minute. These speeds are obtained by gear changes on the synchronous motor drive unit. This unit is attached to the fixed frame of the machine while the dial portion of the apparatus is attached to the moving crosshead. The pointer sprocket wheel and the sprocket wheel on the drive unit are connected by an endless weighted chain. With the gear selected for a certain speed, the hydraulic valve of the testing ma-





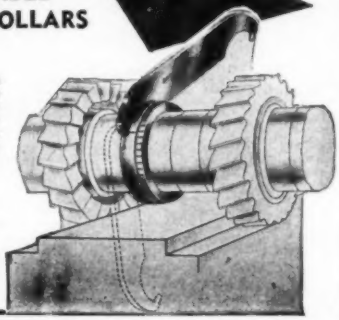
FAST, ACCURATE SPACING

for
SIDE MILLING CUTTERS
GANG MILLING SET-UPS

Graduated in thousandths, you have plus or minus .0005" at your fingertips with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

You can make an accurate, positive adjustment just by loosening the cutter arbor nut and making adjustment as illustrated.



Made in 12 standards for cutter arbors from 7/8" to 2". Write for illustrated Bulletin 120-7.

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DIAMOND ACME TOOLS

Diamonds vary in quality and it is important to use the proper kind for a given job. "Bargain diamonds" are not an economy.

If you don't know diamonds know your diamond dealer. Our 45 years in this field merits your confidence.

ACME DIAMOND TOOL CO.
15 MAIDEN LANE, NEW YORK, N. Y.

TOOL CRIBS & PARTITIONS





WINDOW GUARDS
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WIRE MESH IN STANDARD SECTIONS

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MODEL W-SR — 55,000 RPM

A production tool, smooth in operation, engineered to fill a broad field where a fast bench unit can be used most advantageously. It saves time by taking the part to be machined to the grinder instead of taking the grinder to the part as in the case of a portable tool. It leaves the operator with both hands free to handle the work; the result, much more production. 3 stages of power. Prompt Deliveries.

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DRILL 6 HOLES AT ONE STROKE—ADJUSTABLE FOR ANY PATTERN!

Your drill presses equipped with adjustable MULTI-DRILL heads will

- Reduce costs thru multiplying your present drill press production
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- Reduce your equipment investment
- Often save their cost on the first job

The MULTI-DRILL attaches conveniently to most ½" drill presses. Its six radially adjustable spindles are quickly set to any hole pattern within 5" circle—¾" minimum centers. Standard capacity ⅛" to 17/32" drills. Modifications available for special applications.

Write today for circular.



COMMANDER MFG. CO.
4227 KINZIE ST.,
CHICAGO 24, U.S.A.



chine is opened until the loading head rises to a point where the dial pointer stands still. This means that the pointer sprocket and the motor driven sprocket below are moving at exactly the same speed. They counteract each other. This adjustment is very simply made.

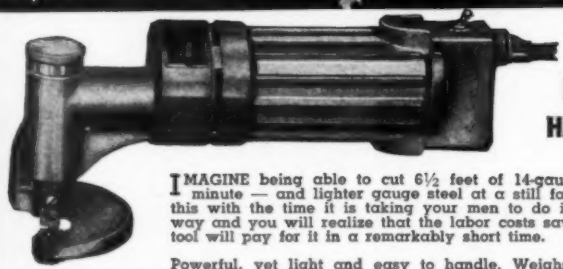
The Pacer actually is a combination tool since it also can be used as a deflectometer. The dial is divided into two hundred graduations of .001" each, and if the synchronous motor is not turned on, the dial will indicate the deflection of a specimen under test.

WAHLSTROM CHUCK BULLETIN

Manufacturers who are looking for stronger, more flexible, fully-automatic drill chucks, which require neither keys nor collets, and for automatic tapping attachments will be interested in bulletin 56 released by The Wahlstrom Tool Division of American Machine & Foundry Co., 5502 Second Ave., Brooklyn, N. Y.

Complete with easy-to-understand diagramatic drawings and cutaways, the folder gives construction details, special applications, and complete size ranges.

How TO CUT SHEET METAL FASTER!



GES-9 ELECTRIC HAND SHEARS

IMAGINE being able to cut 6½ feet of 14-gauge sheet steel per minute — and lighter gauge steel at a still faster rate! Compare this with the time it is taking your men to do it the old-fashioned way and you will realize that the labor costs saved by this electric tool will pay for it in a remarkably short time.

Powerful, yet light and easy to handle. Weighs only 6 lbs. Cuts accurately — not only along straight lines but also around small curves. Alloy steel cutters. Ball-bearing, grip-type Universal motor, ⅛ horse power. Operates on either AC or DC. Models for 110 or 220 volts, 25 to 60 cycles. Fuse protection incorporated in fuse box.

WRITE FOR LITERATURE

Jefferson Engineering & Mfg. Co.
269 Walker Detroit 7, Michigan

PHYSICAL CONSTANTS OF METALS
(20° C Unless Otherwise Specified)

Material	Resistivity Microhms/CC	Temp. Coefficient of Resistance	Specific Gravity	Specific Heat	Coeff. Thermal--Cond.
Aluminum	2.688	.00403	2.70	.214	.5
Barium	9.8	.0033	3.78	068	
Beryllium	10.1			.397	
Brass	8	.002	8.6	.092	.26
Bronze	17.8	.0005	8.8	.086	
Carbon	3500 at 0°	.0009	3.52	.165	
Calcium	4.59	.00364 (0-600)	1.54	.157	
Chromium	2.6 at 0°		6.92	.11	
Cobalt	9.7	.00658 (0-100)	8.71	.10	
Copper	1.724	.00393	8.89	.0921	.918
Gold	2.44	.0034	19.3	.0312	.7
Graphite	800 at 0		2.25	.17	
Iron	9.8	.0065 (0-100)	7.8	.107	.161
Iron Cast	79-104		7.03	.118	
Lead	22.0	.0039	11.4	.0306	.083
Magnesium	4.46	.004	1.74	.246	.376
Manganese	5		7.42	.121	
Mercury	95.8	.00089	13.59	.033	.015
Molybdenum	5.06 at 0	.0047 (0-100)	9.0	.065	.346
Monel Metal	42	.002	8.9		.060
Nickel	7.8	.00537 (20-100)	8.9	.105	.142
Platinum	9.83 at 0	.003	21.4	.0324	.166
Potassium	6.1 at 0	.0055 at 0	.851	.19	
Silver	1.629 at 18	.0038	10.5	.056	1.0
Sodium	4.3 at 0	.0054	.951	.295	
Steel (Soft)	11.8	.004	7.7	.118	.115
Steel (Hard)	45.6	.0016	7.7	.118	.115
Steel (Nickel)	30-85	.0007	7.7	.118	.115
Tantalum	15.5	.0031	16.6	.036	.130
Thallium	17.6 at 0	.0040 at 0	11.85	.038	
Thorium	18	.0021 (20-1800)	11.5	.027	
Tin	11.5	.0042	7.3	.054	.155
Tungsten	5.5	.0047 (0-100)	19	.034	.476
Zinc	5.75 at 0	.0037	7.1	.093	.265

Note: Data compiled by the Industrial Electronics Division, Westinghouse Electric Corporation, Baltimore, Md.

THREAD MILLING

INTERNAL & EXTERNAL THREAD GRINDING

LARGE HEAT TREATING PLANT

Equipped to give you production milling and grinding to a total tolerance of .0001 in.

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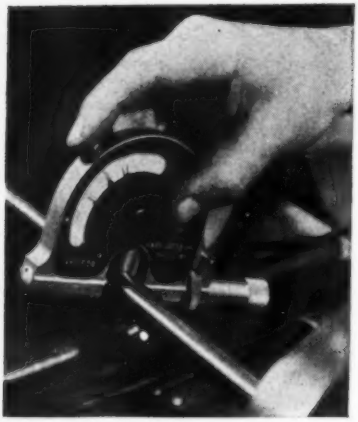
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ZEISS PASSAMETER



Here is an adjustable indicating snap gage used for mass checking of high precision parts, like twist drills, etc. Capacity for external measurements is 0 to ¾". Guaranteed accuracy is plus or minus .0001".—The anvil has a constant measuring pressure of 2 lbs., independent of individual feel.—Both anvil and spindle have lapped tungsten carbide measuring surfaces.—Sturdily constructed—it is intended for use at the machine as well as for inspection. Ask for description Fe-842. Made by Carl Zeiss, Inc., 485 Fifth Ave., New York 17, N. Y.

AMPCO METAL IN GEARS

"Ampco Metal in Gears" is a four page bulletin describing the use of this aluminum bronze in gear applications, issued by Ampco Metal, Inc. Milwaukee 4, Wis. The bulletin emphasizes superiority of this alloy over ordinary gear bronze and contains a table showing preferred grades of Ampco Metal for various types of gear service.

The bulletin points out that common causes of gear trouble are breakage, deformation, wear or flaking and pitting of the teeth, whereas Ampco Metal's high tensile strength, yield strength and elongation aid in eliminating breakage encountered in weaker bronzes.

No Leaks
No Levers
No Packing

Air-O-chek AIR GUNS

Air-O-cheks have the ball and socket joining the enclosed lever to the valve.

Note double grip afforded by long, extra heavy ferrules machine-formed over special shoulder on shank.

Made of Bar Brass and Stainless Steel

Comparison quickly demonstrates such Air-O-chek advantages as leak-proof operation, ease of use, dependability and time saving.

That's why four out of five plants adopt Air-O-chek Air Guns as standard after a comprehensive test.

Try it. Install a dozen Air-O-cheks and compare results with the best you ever had.

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6 DAYS DELIVERY

For First Shipments on Accepted Orders

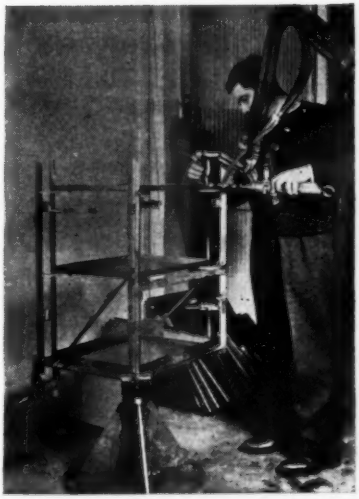
Spur and Spiral Gear Hobs, Spline Shaft Hobs, Worm Gear Hobs, To Class B Limits; Involute Gear Cutters, Special Form Milling Cutters, Thread Milling Cutters, Multiple or Single in Class 1, 2, or 3 Fit, Jigs, Dies, and Fixtures.

U. S. MACHINE TOOL MFG. CORP.

CLINTON, INDIANA TELEPHONE 85

SPOT WELDING NEW PRODUCTS

An illustration of how mass production methods such as spot welding with automatic or semi-automatic equipment can be employed during reconversion months to get certain types of products on the market speedily and economically is shown by a recent venture of a Midwest cabinet manufacturer. With the aid of assembly spot welding, the company was able to have a trial lot of 5,000 all-steel utility tables—for domestic, commercial, and industrial uses—in the hands of retailers within about five weeks' time after the project had been authorized, and without major investment in production equipment.



Portable gun spot welding—carried out in the job welding department of Progressive Welder Co., Detroit—was the fabricating method.

The tables consist of four legs and three shelves each. All components are of 16 gage steel stampings. There are 10 pieces representing but two different shapes, needed in the construction of each table. The simple sections requiring no expensive press dies are assembled with a total of 24 spot welds—two spots on each leg at each shelf. This fastening method



OILY FLOOR TROUBLES STOPPED with FULLERS EARTH!

An oil and grease absorbent that replaces sawdust or wood shavings. Lessens fire hazard! Stops accidents due to slipping on oil or grease! Low priced — economical — safe! Write for FREE SAMPLE or ask for trial order at quantity price!

TAMMS SILICA CO., 228 N. La Salle St., Chicago 1, Ill.



STANDARD D-4 Abrasive Band Grinder

Famous for Stamina

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING—WRITE TODAY

WALLS SALES CORP.
96 Warren St., New York, N. Y.

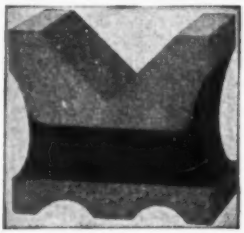
is combined with interlocking of the members which thus produces exceptional strength and rigidity in the completed table.

A standard C-type Progressive portable resistance welding gun was used to make the spot welds. Only a single clamping type rotary work-holding fixture—designed and built by Progressive—was necessary to complete the assembly of the tables.

A production speed of 16 tables per hour with one operator was easily attained, thus permitting the entire lot of 5,000 units to be placed within the hands of the retailer some five weeks after the inception of the project.

This number of all-steel tables of one size is generally considered a high production run and normally involves considerable financial investment in dies, jigs and fixtures and other equipment with which to fabricate the units. Use of spot welding made possible the production of the 5,000 tables at a minimum overall cost and so permitted large-scale local sampling of the market for this particular item in a space of time generally held to be insufficient to make even a cursory market analysis.

"TRU-V" BLOCKS



Why Not Save Time—by having enough V-Blocks available at all times in your shop to avoid the delays involved in make-shift set-ups and tie-ups?

"TRU-V" Cast-Iron Blocks are available in nine sizes—from 3½ to 10", in three styles. Each block is carefully machined on all sides, with close limits held within .001" where required. A machined ledge on both sides provides for clamping on machine bed.

Let us send descriptive bulletin.
Or contact your mill supply dealer.

Oliver Motorcraft Corp.
2532 S. Wabash Ave., Chicago, Ill.

GRANT RIVETERS

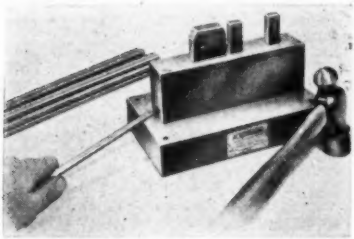
will PEP-UP your NEW Production JOBS



A great help in War Production, these GRANT Riveters are available in Noiseless Spinning and Vibrating Hammer types. Also Vertical and Horizontal Multiple Spindle Spinning Machines.

THE GRANT MFG. & MACHINE CO.
C E Station, Bridgeport 5, Conn.

HAND STAMPING JIG



This new Acromark hand stamping jig was designed to provide an economical means for marking a limited quantity of engine crankcase "dip sticks". The requirements of this job called for neat uniform markings indicating directions for checking fluid level and also reference points for "Full and Low" readings. It was of course essential that these points be properly located with respect to one end of the metal rod used.

The tool lends itself particularly to applications of this type, requiring a fair degree of accuracy in the location of stamping, especially on jobs where quantities are not excessive, in which case, automatic power equipment would be indicated. The separation of marking into areas which can be easily sunk with a hammer blow also facilitates changes in wording or replacement of individual die sections rather than the entire die.

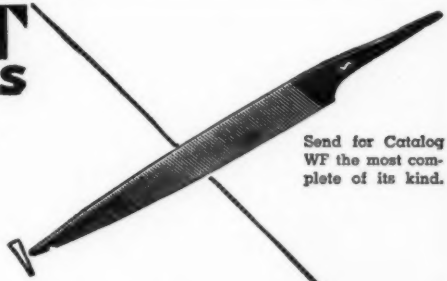
An improved method of holding the marking stamps in position eliminates chatter marks on the stamped part and allows both large and small stamps to be individually preloaded to the correct tension for best results.

The tool is portable and since it is mounted on a heavy steel base or anvil, it may be set-up for use on any type of table or bench. While small and relatively inexpensive, it can handle marking which would normally require a press of from 50 to 60 tons capacity or one having excessive bolster area.

For further information, address The Acromark Co., 15 Morrell St., Elizabeth 4, N. J.

GROBET
SWISS FILES

OVER 500 SHAPES
and SIZES FOR
EVERY PURPOSE



Send for Catalog WF the most complete of its kind.

Genuine Grobet Precision Swiss Files are world famous for utmost precision and durability since 1812.

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421 Canal Street — New York 13, N. Y.
IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

Here is an *Improved Way* to . .

Handle Materials and Position Work



LYON-Raymond

Hydraulic

HIGH-LIFT TRUCK

Modern welded tube and formed plate construction, designed for strength, rigidity and safety. Weighs only half as much as an ordinary tiering truck of comparable capacity.

1. LIFTS AND TRANSPORTS
Will pick up a skid load as handily as the usual type of lift truck. Easily transports capacity loads and can be steered into any space accommodating its width.

2. SUPPORTS
An adjustable support for overhanging work on drill presses, shears, cut-off machines, punch presses, etc. Serves also as a feed table for many operations. Secure floor lock.

3. LEVELS
Exact leveling for changing dies in presses. Ideal for transporting heavy die sets, fixtures and tools to and from storage bins.

4. POSITIONS
Adaptable to positioning work in lathes, loading and unloading heavy work from other machine tools. Quicker and safer than with a helper and chain hoist.

5. LOADS AND UNLOADS
One man can do the work of many in loading and unloading freight. Especially convenient where shipments are delivered to curb or where docks are not available. Hydraulic operation assures ease and safety.

6. TIERS
An easily maneuvered truck, adaptable to tiering. Among other uses it serves as an adjustable work table for machining, assembly and general toolroom work.

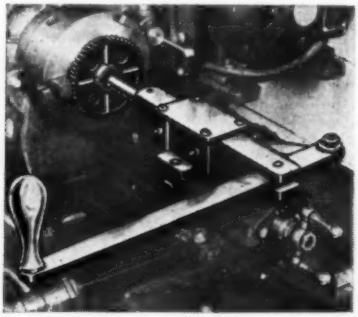
DELIVERIES FROM STOCK
Write for
BULLETIN 136

LYON-Raymond Corporation
459 Madison St., Greene, N. Y.

INTERNAL KEY SEATER

A new lathe accessory, designed to simplify internal key seat cutting with Atlas, Craftsman, and similar lathes, is announced by the John E. Kandler Co., Kalamazoo, Mich.

This attachment, called the Watkins Internal Key Seater, is anchored to the compound slide as easily as a Tool Post in only 30 seconds. With his right hand working the powerful long handled lever, the operator produces an easy reciprocating ram motion. His left hand determines the depth of cut using the graduations on the crossfeed dial. The average time for cutting a standard 3/16" internal keyway is said to be one minute. In cutting multi-keyseats or splines, all spacings divisible in 60 are obtainable by using the hole circle on the bull gear of an Atlas lathe.



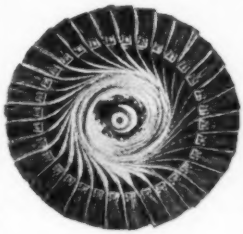
By combining this attachment with the right shape cutting tools it is useful for straight oil grooves or gear teeth. A chuck set-up can easily be made for cutting outside keyseats and splines on shaft ends and, since it mounts on the compound slide, it is adjustable for cutting keyways in tapered holes and shafts.

Standard equipment includes one 1/8" cutter, one 3/16" cutter, and two Allen wrenches.

HYDRAULIC PRESS CATALOG

The unusual Rodgers Portable Hydraulic Press is completely described in a new catalog just released by Rodgers Hydraulic, Inc., Minneapolis, Minn. Specifications, capacities, and other informative details are given. Also shown are illustrations of the versatility of the press made possible thru its simple, unique design and adaptability to most any heavy duty pulling or pressing problem, such as gears, pinions, bushings, etc.

The Perfect Pair



Vonnegut Brush-Backed Abrasive Head with end-cap removed.

The Vonnegut Brush-Backed Abrasive Head and Vonnegut Spindle Stand work together to produce the best jobs of metal finishing. This combination is unexcelled for deburring edges and corners . . . for smoothing irregularly shaped surfaces . . . to prepare metal parts for other finishing operations.

Vonnegut Direct-Drive spindle stands are available with either 1 HP or 2 HP motors, narrow or wide types, to be used by either one or two operators at one time.



Double End Spindle Stand with two Abrasive Heads.

For details, write to:

VONNEGUT MOULDER CORPORATION

1805 MADISON AVENUE — INDIANAPOLIS, INDIANA

New THREAD PICK-UP PROJECTOR INCREASES GRINDER PRODUCTIVITY AS MUCH AS 50% . . . SOMETIMES MORE!



- **Reduces grinding time**
- **Wheel and Diamond Life greatly prolonged**
- **Stock removed equally from both flanks**
- **Beginners can use expertly — quickly**
- **Salvages threaded parts oversize .0003 or more**

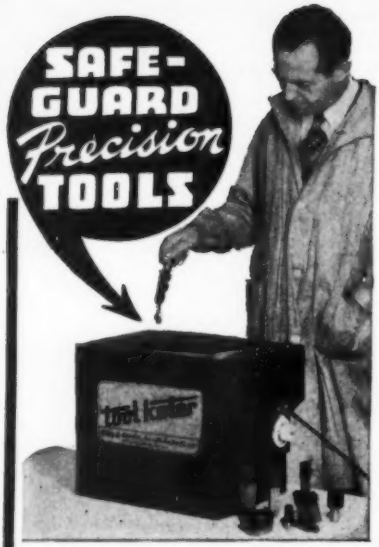
The Thread Pick-up Projector is an optical device for setting the driving dog on pre-threaded work. Allows grinding wheel to enter trough of thread to remove finishing stock from both flanks accurately and without adjustment. Lead is picked up while previous piece is being ground — no time is lost. Viewing screen enlarges thread for quick, accurate check of root depth and angle. Picks up A.N., Acme and Whitworth threads. Operates in conjunction with any thread grinder.

ACME INDUSTRIAL CO.

(SCIENTIFIC DIVISION)

Write for BULLETIN No. 441 today!

210 NORTH LAFLIN STREET
CHICAGO 7, ILL. MON. 4122



TOOL KOTER

A Few Good Reasons Why You Should Protect "Precision" With "Tool Coat"

1. "Proven Performance" say many users who have already installed this modern method of protection for precision, carbide tools, gages and spare parts.
2. Cost is negligible compared with previous methods of rust proofing and wrapping.
3. Superior protection against breakage, corrosion and long time storage.
4. Simple application with newly developed "Tool Koter," readily portable, weighing only 50 lbs., engineered to meet all your tool coating requirements.
5. Low wattage, can be plugged in ordinary socket, all welded steel construction, heavy duty automatic thermostat, thoroughly insulated.
6. Price of "Tool Koter" only $67.50. Includes special heat transfer oil—ready to operate.

If you are already using this method of protection, investigate Seibert's "Tool Coat" for best results—meets all Government specifications. Prompt Delivery.

Write for details. Let us submit recommendations without obligation.

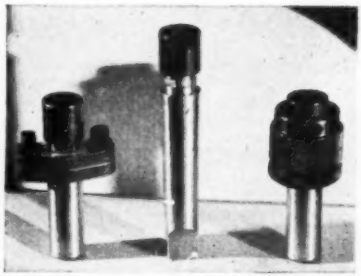
RILEY & GEEHR, INC.
ONE NORTH LASALLE ST.,
CHICAGO 2, ILL.
Phone: Andover 5292

Other Rodgers equipment described in the catalog are:—shop presses, hooks and lugs for pulling, jacks, hydrostatic test units, power-operated hydraulic pump units, and pipe-straightening equipment. The catalog will be interesting to everyone responsible for the maintenance and servicing of equipment—especially where easily portable hydraulic press power can be used to advantage.

KETT EXPANDS LINE

A unique Floating Tool Holder is included in the line of Chuck and Floating Tool Combinations currently introduced by the Kett Tool Co., 5 East Third St., Cincinnati 2, Ohio.

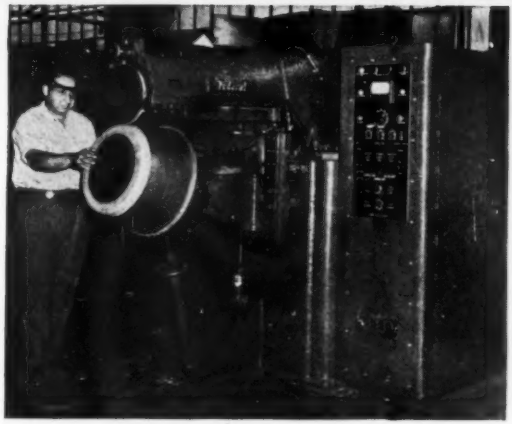
The new chucking tools embody the Kett "three jaw power grip" as an integral part. The accuracy, gripping power and long life of these tools, combined with their unusually small size, adapt them for use with screw machines, lathes and drill presses, on drilling, reaming and small tapping operations.



The chuck will hold shank sizes from No. 80 Drill to a full ¼" without changes of any kind. The makers emphasize that it saves time and labor in tool chucking operations, because it eliminates the necessity for many sizes of bushings and collets for machine set-up requirements.

The new Kett line includes Taper Arbor and Straight Shank Chucks in various shank sizes, and two types of Floating Tool Holders:—Model KFTM, Kett Chuck and Floating Tool Holder, features the new, more compact, more easily-adjusted Floating Tool Holder. Includes all standard Kett features already described with the added advantages of smaller size and maximum simplicity of adjustment, due to the single locknut design.

Model KBSM, Kett Chuck and Floating Tool Holder, available at minimum initial cost, includes all standard Kett features, with addition of the conventional-type Floating Tool Holder.



Largest Roll Spot Welder Speeds as high as 300 welds per minute on .032" aluminum sheets are being obtained at the New Kensington plant of Aluminum Co. of America on this Federal welder. The Westinghouse electronics controls charge as many as 84-120 mfd capacitors (10080 mfd) from 1500 to 3000 volts with a peak demand of 100 kva on a 3-phase system. Each time this charge is "dumped" into the welder transformer, a weld is formed. Electronic controls for the capacitor discharge system assure the right amount of current for consistent welding results whether .032" sheet or .187" sheet is being put thru the welder.

B & S COLLETS AND FINGERS

General Die and Stamping Co., 262 Mott St., New York 12, N. Y. announces addition of the Brown & Sharpe series to its line of Precision Collets and Feed Fingers. The popular No. 00 and No. 10 collets and fingers are now available for immediate delivery in all round sizes in 64th" steps. Other models to complete the series will follow shortly. A new catalog sheet is ready, and may be had upon request.

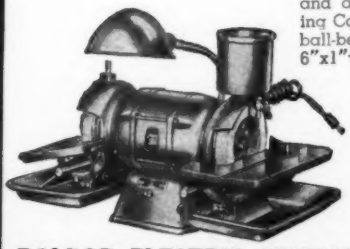
BALDOR
BALL BEARING GRINDERS

A Complete Line

for every grinding job



AT LEFT: Special Carbide Tool Grinder for quickly and accurately sharpening Carbide Tools. ½ HP ball-bearing Motor. 6"x1"wheels. **$110.00**



AT RIGHT: Baldor Pedestal Grinder No. 121; 2 HP motor; 12"x2" wheels **$199.00**

ASK FOR BULLETINS

BALDOR ELECTRIC COMPANY 4368 Duncan Ave., St. Louis 10, Mo.

MADCO'S TURRET DRILL HEAD

Model No. 275, one of six new spindle turret attachments for drill processes now available for immediate delivery by Madco Products, Inc., 516 Fifth Ave., New York City (formerly Machine Development Co.), features an Indexing Depth Stop designed to control the drilling depth of each of the six spindles of the Turret Head. The Depth Stop mechanism comprises a cylindrical drum carrying six adjustable stops. The drum is geared to the Turret Head and automatically indexes when the Turret Head is turned.

Among the features are No. 1 Morse Taper precision-ground spindles, fully enclosed pre-lubricated bearings; sturdy aluminum alloy construction, ball and detent arrangement to indicate correct indexing positions, accurate, friction-type (no gears) clutch mechanism, and a guaranteed drilling accuracy of one-thousandth of an inch (.001"). All MADCO Turret Heads also have a ½" drilling capacity.

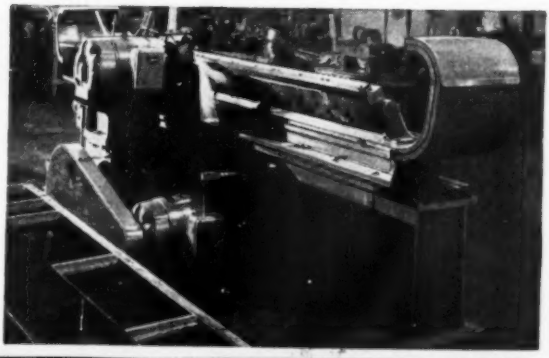
Two other improved models of MADCO Turret Heads are also available for immediate delivery. These units are Model Nos. 274 and 273. Model 274 is identical to Model 275, but is not equipped with the Indexing Depth Stop. Model 273 is also identical to Model 275 except that



ROGERS "NT"

USED FOR ACCURATE PRODUCTION FINISH BEVELING

This heavy-duty Rogers Grinder, with two motors (one for grinding head and one for carriage traverse), gives close accuracy results for nationally-known saw manufacturer. Model "NT" has automatic oiling system, extra-wide "V" ways and Rogers quality construction. Send for circular "NT" and reasonable prices. 5 sizes—from 48" to 134".



SAMUEL C. ROGERS & COMPANY
207 Dutton Ave.
BUFFALO 11, N. Y.

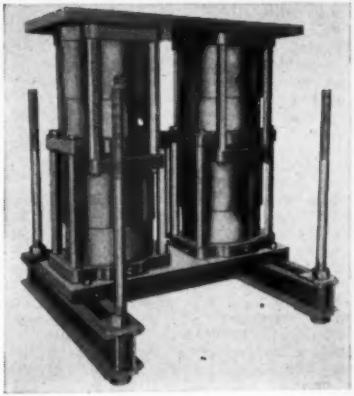
ROGERS KNIFE GRINDERS

it is provided with solid, one-piece, precision-ground spindles having either No. 2 or No. 33 Jacobs Tapers to fit corresponding Jacobs chucks, instead of the No. 1 Morse Taper Spindle, and it is not equipped with the Indexing Depth Stop. Madco Turret Heads are designed to fit practically all types of medium size drill presses having quill diameters from 1¾" to 2⅜".

PNEUMATIC DIE CUSHIONS

This multiple tandem-type Model 2-CC of Dayton Rogers Mfg. Co., Minneapolis 7, Minn., is now available in cylinder sizes from 6" to 24", having capacity for producing a draw ring holding pressure from 6 tons to 100 tons. The hardened and ground pin pressure pad is custom-made to fit a given press bed opening and is held in constant parallel working alignment at all times by design of the tandem cylinder construction, compensating for all off-center loading.

The adjustable supporting structure furnished is so designed that the 4 furnished suspension rods can be mounted to the press bed lugs at any given spacing. The centralized lubricating header block is furnished, making it possible to lubricate readily all cushion cylinders regularly from side of press.

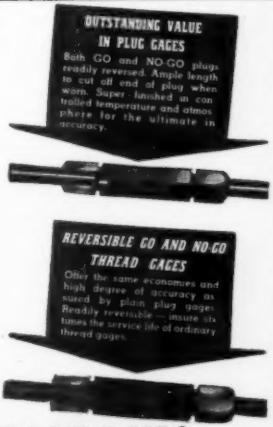


These pneumatic die cushion models are particularly adaptable to large straight-side presses where maximum ring holding pressure is required in proportion to total overall press tonnage.

Salvage your surplus war plug gages!

Plug gages of any make purchased for war production, unsuitable for your "peacetime" precision manufacturing, can be traded in on new **GO AND NO-GO Chromium Plated REVERSIBLE Gages.** Send for details.

Size Control **GO AND NO-GO Reversible Gages** can be reversed at each end of the universal handle. Plugs can be cut off an average of three times at each end, giving six times more service life. **Super-Finished** to minus 1½ micro inches, greatly reducing friction and increasing service life. **Colored GO and NO-GO Indicators.** Available in all standard sizes, from stock. Special sizes on order of Stellite, Carbide, Norbide and up to .250" in sapphire. Bulletin No. 945 will help you.



SIZE CONTROL COMPANY

DIVISION OF AMERICAN MACHINE & GAGE CO.

MAKERS OF PLAIN AND THREADED PLUG GAGES—GAGE SETS—DRILL SETS—FRACTIONAL SETS—THREAD WIRES—GEAR WIRES

Plant 4648 Fulton St. Chicago (44). Offices in Buffalo, Elmira, Rochester, Syracuse and New York City. Milwaukee, Detroit, Minneapolis, Cleveland, Indianapolis, and Greenwich, Conn.

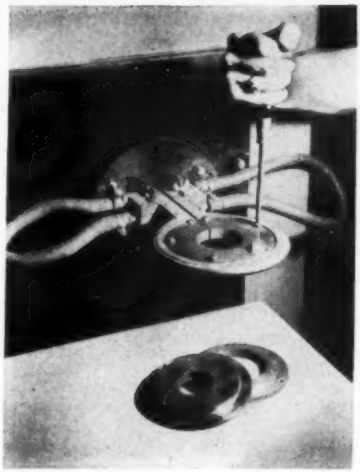
"THERMONIC" MASTER COILS

Induction Heating Corp., has recently developed a master coil with removable inserts designed to eliminate problems of coil changing in setting up Thermonic equipment for various induction heating applications. These inserts can be changed in a matter of seconds and are now available in complete sets which will accommodate diameters ranging from ⅛" to 3" in small increments.

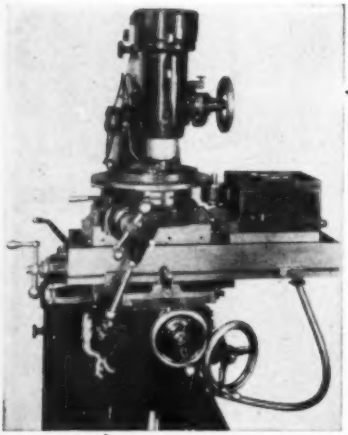
The basic master coil consists of a rugged, water-cooled inductor block, machined to take inserts which go to make up the actual coil. Used with a Thermonic Output transformer, this new development gives, in effect, a single-turn inductor block of variable inside diameters. Inserts can be of any desired thickness, thus making the coils capable of heating axial bands of various widths to produce the many heat patterns possible with induction heating.

Insert is held in place by easily-removable screws, and when installed, obtains its cooling by thermal conduction from the master coil. Inserts may be used in multiples, offering the flexibility of many different coils of unusual contour.

The advantages of such a master coil set-up are many and varied. Primarily,



it lends itself to the experimental work which is involved in designing a production coil for a given application.



CONTOURING MACHINE . . .

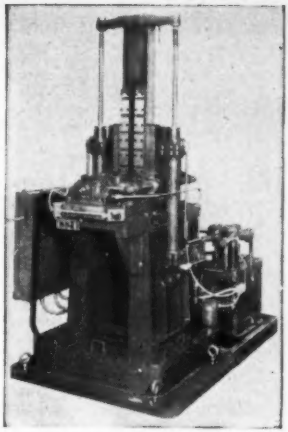
For milling all types of irregularly shaped parts

REPRESENTED BY PRATT & WHITNEY

THE TAYLOR & FENN CO.

HARTFORD, CONN. U. S. A.

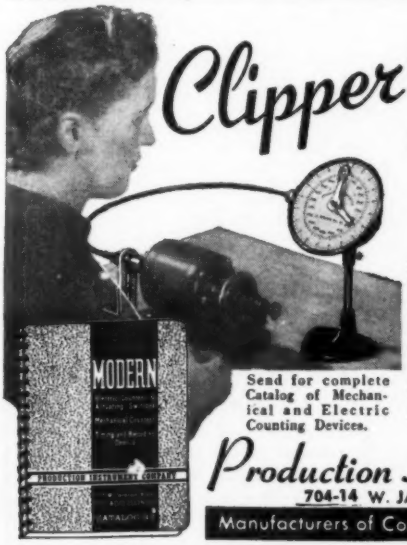
The standard Set, consists of two Master Coils and 48 Inserts contained in a specially constructed wood chest. The smaller Master Coil, with 27 inserts, accommodates round stock ranging from its cooling by thermal conduction from ⅛" to 1¼" and these inserts are of three thicknesses for each diameter; ⅛", ¼" and ½". The larger master coil, with 21 inserts, takes stock ranging from 1½" to 3" and inserts are in the same three thicknesses as far as the smaller coil. Blank inserts are available to allow user to cut the desired contour to match the particular work, and special inserts will be made on order.



HY-MAC BROACHING MACHINE

Special purpose machine for broaching the I. D. and Split-Line surface of automatic type precision half-bearings, has been completed by Hydraulic Machinery, Inc., 12825 Ford Rd., Dearborn, Mich. The cycle of these vertical type machines, is entirely automatic except for loading and unloading.

Advantages cited for this machine include high production, positive alignment and clamping of bearings, adaptability to different sizes of nests for various sizes of bearings and adjustable broaching speed. These machines are powered by Hy-Mac Hydraulic Power Units. The cycle of the machine is accomplished by hydraulic sequence valves, solenoid operated 4-way valves, pressure switches, limit switches and special electrical control panels.



Clipper HIGH SPEED Coil Winding Counter

Brings counter *close to coil* for *precision winding at high speed* with reduced fatigue of operator. Counts to 10,000 turns per minute. *Quick one-motion reset.* Heavy duty construction and precision assembly with *gears hobbed on own shafts* for vibrationless operation and *accurate reading at high speed.* Prompt deliveries.

Send for complete Catalog of Mechanical and Electric Counting Devices.

Production Instrument Company

704-14 W. JACKSON BLVD. CHICAGO 6, ILL.

Manufacturers of Counting, Timing and Recording Devices

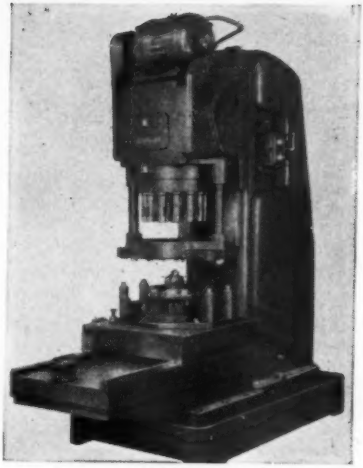
LEMAIRE VERTICAL DRILL

Another standard machine has been added to the line of vertical drilling machines made by LeMaire Tool & Mfg. Co., Dearborn, Mich. It was designed and built for accurate single or multiple spindle drilling and boring of extra heavy parts; and is identified as Model No. 20.

Machine is furnished with a spindle having a milled drive slot for multiple head adaptation. Provision is made for a Morse taper adapter for single spindle operations.

Movement of the head for rapid advance and feed is actuated by means of a heavy duty hydraulic cylinder mounted to the column between the ways, controlled by Vickers control panel. Illustration shows machine equipped with 14 spindles set to drill eight holes 17/32" diameter and six holes 39/64" diameter. Then, while part is still in fixture, six drills are relaced by six reamers to ream the holes to .6245". Magic Quick Change Chucks are used.

By being able to perform three operations without disturbing original setup a user can save considerable time and thus increase production. A manually operated shuttle-type fixture is provided to facilitate loading and removal of parts with a hoist. A rigid box-type table 25x29" maximum is standard equipment. An index table 42" in diameter maximum for either manual or automatic operation can be had at extra cost.



Power is transmitted by V-belts to a pick-off gear shaft, and thru pick-off gears to worm and worm wheel, which drives spindle.

Spindle is mounted in double row ball bearing at upper end and in a double row Timken roller bearing at lower end.

Gears and bearings in driving head are lubricated thru a splash system. Sliding surfaces on head are greased by Alemite system. Automatic lubrication is optional at extra cost.

WHITNEY-JENSEN PRODUCTS
30 YEARS EXPERIENCE

POWER PUNCH PRESSES



Two sizes, 12" and 18" throat depth. Capacity 10 tons, length of stroke 1¼", stroke adjustment 1¾", die space 6". Economical small-size machines for accurate work. Whitney-JENSEN construction features insure durability. Full data on request.

Write for new Whitney-JENSEN AIRCRAFT TOOLS CATALOG

WHITNEY METAL TOOL COMPANY
[illegible] FORBES ST. • ROCKFORD, ILL.

Machinist – All Around

To work and supervise precision shop Peekskill, N. Y. build machines; design and make molds. Splendid peace-time prospects for top notcher. State full details, experience, salary desired.

BOX 449, 217 7TH AVE., N. Y. C.

THE MOST VERSATILE *Time-Saver* IN YOUR TOOLROOM

UNIV-ANGLE

for

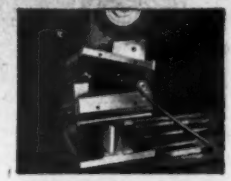
GRINDING JIG BORING
INSPECTION
MANY OTHER SET-UPS

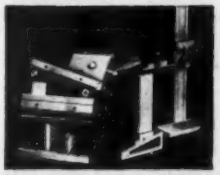


The Magna-Sine unit and the Sine Plate unit of Univ-Angle. They may be purchased and used separately or together in any combination.

UNIV-ANGLE will save time in every department of your plant where fast, accurate angular set-ups are required. Any angle can be set precisely and securely in a few seconds with a standard gage block. Any magnetic material is held firmly but without distortion by the magnetic unit at the turn of a switch. For jig boring and inspection purposes the non-magnetic unit is used, giving the same fast setting and accuracy as the magnetic unit. All units are made of oil hardening steel ground and lapped to the closest limits. Units can be used singly or together in any combination to produce single or compound angles. Compound angles can be changed from right to left hand in a few seconds by simply turning the top unit on its base. The work does not need to be touched.

There are hundreds of operations in your shop where the versatile Univ-Angle will save you time and money on angular set-ups. Write for complete information and prices today.



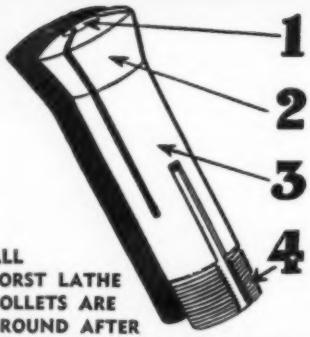




Robbins ENGINEERING COMPANY

318 MIDLAND AVE. • DETROIT 8, MICHIGAN

PORST Bros.
Collets and Feed Fingers



ALL PORST LATHE COLLETS ARE GROUND AFTER HARDENING AT THESE FOUR POINTS:

1. The stock hole. Long gripping surface insures holding power.

2. The taper. Proper angle for easier closing.

3. The body. Close tolerance maintains better concentricity.

4. The threads. Proper fit of angle preserves life of draw bar.

"Porst" is a time-honored name in collets — your guarantee of quality products. Careful inspection at every stage of manufacture assures you utmost accuracy. Porst collets are ground after controlled temper hardening. The threads on the lathe collets are ground from solid.

For the utmost in collet satisfaction, specify a "Porst".

Let us send catalog.



PORST BROTHERS
263 North California Avenue
CHICAGO 12, ILLINOIS

DRAW-IN COLLETS FOR ALL LATHES AND MILLERS, SCREW MACHINE COLLETS AND FEED FINGERS for All TYPES of MACHINES

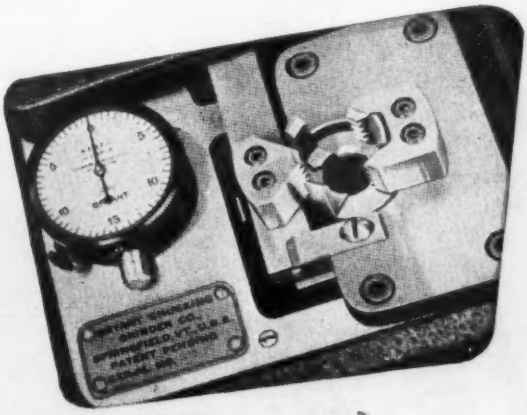
IMPROVED BORING TOOL

Behr Products Co., Warren, Mich., maker of the B. & B. Spot Facer, has completed development work on a greatly improved Boring Bar, which is now in limited production. This new tool is designed in two standard head diameters, 2" and 3½", for use on vertical or horizontal lathes, screw machines and all types of precision boring machines. In recent tests the new Behr Boring Bar is said to have eliminated chatter and taken a faster feed and up to four times wider cut than average tools.



The new Behr Boring Bar is extremely rigid and rugged in construction and has a micromatic blade adjustment. Blades are available in a full range of sizes, either tungsten carbide tipped or faced, or in high-speed steel. Blades are quickly and easily interchangeable by a half turn of the blade-release mechanism. Regular blades bore or face from 1¾" to 12½" diameter with absolute accuracy. A small tool adapter permits boring holes down to ¼" or less.

How to speed thread inspection . . .



Bryant Thread Gages

☆ This new Bryant Thread Gage Catalog describes all the advantages of these unusual gages . . . it tells how you can inspect internally and externally threaded parts four or five times faster . . . it tells how threaded parts can be inspected all over in a matter of seconds . . . it describes and illustrates three standard and one special model for work from 3/8" to 8" internal and 3-16" to 8" external. A free copy is yours for the asking!

send the coupon

BRYANT

CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

BRYANT CHUCKING GRINDER CO.
Springfield, Vermont, U. S. A.

Please send me Catalog No. G3 which gives complete details on the Bryant Thread Gages

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

KIPP
Featherweight
AIR GRINDER



$29.75 IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch Wheel guard removed for better illustration.

Madison-Kipp, the originators of really high speed grinders, recommends this new "Featherweight" model to all toolmakers. In it are utilized fewer parts, and they are made of magnesium and aluminum for extreme lightness. Alloy steel shaft diameter is unusually large for sustained smooth and true operation. Speed is governed at 50,000 r.p.m and there are selected ball bearings, front and rear.

MADISON-KIPP

207 Waubesa St.
MADISON 4, WISCONSIN, U. S. A.

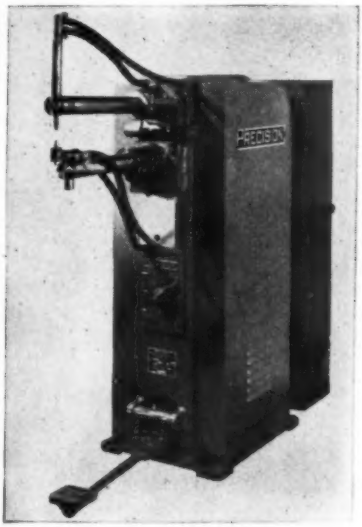
FOOT-OPERATED WELDER

Precision Welder and Machine Co., Cincinnati, Ohio announces a new Precision Rocker Arm Foot Operated Spot Welder said to overcome the major objection to foot operation, lack of pressure by a unique mechanism combining high pressure with minimum operator fatigue.

The features include:—High welding pressures up to 400 pounds on the electrodes with 50 pounds force exerted by the operator.

Minimum treadle movement of 2½" giving 1¼" electrode movement, also adjustable for best operating conditions.

Unit construction with removable side covers for easy maintenance.



Machine styled to combine maximum rigidity with pleasing appearance.

Sides of machine are kept clear for material handling and storage in keeping with motion-time production methods.

Completely new design of transformer mounting clamps the core full length.

Timer and contactor mounted on rear.

Micro-switch firing of timer insures pressure before flow of current.

Fabricated frame of channel construction for rigidity.





ME-3 — ½ H. P. multi-speed counter shaft unit, 900 to 3600 R. P. M. Mounted bench-height on 3-leg caster base. 360° swivel

There was a time, not so many years ago, when the words "Made by Hand" were synonymous with highest quality. In some things this still holds true.

But it is equally true that many operations can be done better and faster, with a greater degree of efficiency, when a Haskins Flexible Shaft Machine is used. And this with much less strain and fatigue on the part of the operator.

Grinding—Sanding—Rotary filing—Wire brushing—Buffing and Polishing—all are machine operations. There are many more. Write for Catalog 45, showing many ways to save your hands and speed production with flexible shaft equipment.

R. G. HASKINS CO.
623 South California Ave., Chicago 12

HASKINS
haskins
FLEXIBLE SHAFT EQUIPMENT

ARO OFFERS NEW DRILLS



The addition of 8 new drills to the Aro line of pneumatic tools is announced by Aro Equipment Corp., Bryan, O. These drills are of 3/16" and ¼" capacity, especially suited to assembly operations.

Model 209 with button throttle and model 309 with lever throttle have aluminum housing, 3/16" or ¼" chuck, and weigh 1 lb 13 oz. These are straight-type drills, 2500 rpm.

Model 2013 is similar to model 209, except it offers a speed of 4000 rpm. Likewise, model 3013 is similar to model 309, with 4000 rpm.

Model 2010 with button throttle, and model 3010 with lever throttle operate at 2500 rpm. They have aluminum housing and handle, 3/16" or ¼" Jacobs chuck, and chuck guard, and weigh 2 lbs 1 oz.

Model 2014 is similar to model 2010, except speed is increased to 4000 rpm. Model 3014 is similar to model 3010, with a speed of 4000 rpm.

Standard equipment with all eight models includes 8 feet of ¼" hose with ⅛" and ¼" male fittings on ends.

COMTOR GAGING BULLETIN

Gaging of precision holes is discussed in Bulletin No. 31 describing the "Shock-Absorbing Comtorplug Internal Comparator" just released by The Comtor Co., 62 Rumford Ave., Waltham 54, Mass. Contents include: — description of the unique Comtorplug principle of gaging precision holes, to fractions of .0001", providing automatic self-alignment and self-centering of this expanding plug gage; illustrations of Comtor plugs in use on actual work gaging holes in various products and parts; description of the sizes and capacities from ¼" diameter to 8" diameter and larger, also special types with extended inreaches up to 17" or more; explanation of the interchangeability of all plugs in any amplifier; description of the shock-absorbing construction which suits Comtorplug to use by machine operators and bench inspectors as well as final laboratory inspectors; a complete list of sizes and prices.

Save hands with Strand's

SWEEP SAFGUARDS

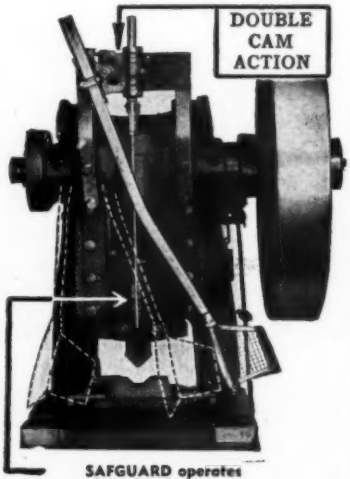
With the Strand Sweep double cam action, you obtain proper sweep movement that prevents accidents. Operation of Safguard from press head provides additional safety in case of screw or other breakage.

Send for Circulars on Strand Sweep and Enclosure Safguards

STRAND MFG. CO.

Safety Engineers

607 W. Lake St. Chicago 6, Ill.



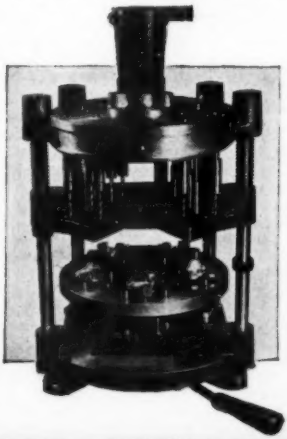
SAFGUARD operates from head of press

A sure way to speed up small parts drilling and tapping



A sample of Ettco-Emrick results

60 high-precision operations were called for on this die-cast aluminum body and cover—18 drilling, 27 countersinking, 3 counterboring and 12 tapping. With four Multiple Heads engineered and supplied by us, all 60 operations are done in 90 seconds. Below is one of the Heads with its indexing fixture all ready to put on the drill press.



Whether a part has 2 holes or many, we can tool you up with Ettco-Emrick Multiple Spindle Heads to give you any drilling or tapping production you need.

The reason is that these Heads are more than just tools for drilling or tapping a number of holes at a time. Each head is engineered for a particular part to make possible the *fastest handling* of the part and the drilling or tapping of the *maximum* number of holes at every stroke of the press.

We can give you these results on a wide range of small parts, because the Ettco-Emrick System includes a dozen different work handling devices like the indexing fixture on the Head illustrated. They reduce the operator's work to loading parts and working the press. All locating, clamping and releasing is automatic.

Initial cost is low because Ettco-Emrick Multiple Heads are made of standard parts and handling fixtures are all standardized. And this is a temporary outlay, for it is paid back in quick time by savings in man-hours and machine hours.

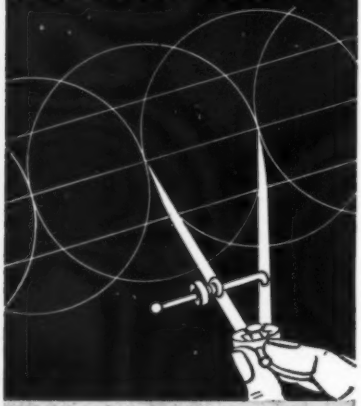
FOR RECOMMENDATIONS on any particular small part, send us a sample or drawing with required production figures. We've engineered hundreds of such jobs and know the answers on small parts drilling and tapping.

For more examples of Ettco-Emrick results WRITE for the "Multiple Head reprints"

ETTCO TOOL CO.
596 Johnson Ave., Brooklyn 6, N. Y.
Detroit 1 **Chicago 6**

Over 25 years specialization in solving industrial drilling and tapping problems

Miccro Supreme
LAY-OUT AND IDENTIFICATION DYE



IN (12) COLORS:

136-Red . . 134-Blue . . 103-Green
104-Black..141-Cerise..137-Violet
138-Tangerine . . 139-Chartreuse
*142-Purple . . . 140-Aquamarine
121-Brown . . 101-Yellow
*Shipped unless otherwise specified.

USED FOR:

Tool, Die, Pattern or Template Layout on Metal . . Quick Identification of Bar Stock, Sheet or Strips, Tools, Dies or Parts.

Dries Instantly — Easily Removed

Circular giving full information and prices sent upon request

MICHIGAN CHROME & CHEMICAL COMPANY
6340 E. Jefferson Ave. • Detroit 7, Mich.

QUADRILL-QUADTAPPER

Chicago Drillet Corp., 922 S. Michigan Ave., Chicago 5, Ill., announces two new items. Quadrill is a 4-position turret drill head that attaches directly to the quill of the press. This attachment can be used for all drill press operations when the tools for the work can be held and driven in any ordinary drill chuck. The rotary device accommodates four boring or cutting tools. One tool only is in motion when the head is in operating position. The spindles, which are driven by a patented locking device, are fitted for No. 32 Jacobs chucks. Rigid alignment, ease of attachment and quick indexing are other features of the unit. Quadtapper is a high-speed, self-reversing tapping attachment having a ¼" tap capacity and designed for use only on the Quadrill. The unit is interchangeable with any of the four spindle assemblies of the Quadrill.

ALLOY STEEL SELECTION

"Fitting the Steel to the Job", published by the Carpenter Steel Co., 314 W. Bern St., Reading, Pa. is a 16-page booklet explaining the uses and advantages of alloy steels to tool steel standards, better to meet special physical requirements and inspection standards. It gives hints on selecting alloy steels to meet specific job requirements, such as extra fatigue resistance on parts exposed to extreme vibration, special combinations of toughness and wear resistance, high elongation in tensile tests on transverse sections, etc.

MIDGET-TYPE DRILL JIGS

Siewek Tool Division of Domestic Industries, Inc., 231 S. La Salle St., Chicago, Ill., has announced two new midget-type rapid clamping drill jigs to supplement the regular line of larger-size standard jigs. Made in two small sizes, with work areas of 1⅛" x 2" and 1½" x 3", these new small size jigs are built to precision standards for precision work.

Designed to operate in both a vertical and horizontal position, Siewek midget-type jigs may be used either as a drill jig or as a rapid clamping vise for many operations. Either model may be operated as right or left hand by a simple adjustment.

Although light in weight, Siewek midget-type jigs are said not to release under chatter and to be free from back-lash. The manufacturers have designed these jigs to provide uniform right-angle pressure for secure, accurate holding power, with quick release and plenty of room for chip clearance.

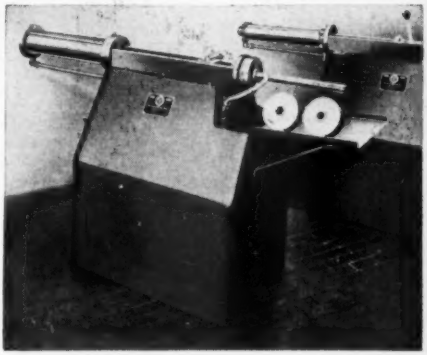
ZAGAR IMPROVES HORIZONTAL BROACHING MACHINE

The illustration shows improved design of Zagar 20" Hydraulic Horizontal Broaching Machine. The noteworthy change is cutting away upper righthand corner of cabinet to permit broaching larger bars and other stock.

Size of piece which may be handled is limited only by depth; i.e., distance from center of adaptor down to pan. This distance has been increased to 10".

Also, pull has been doubled—from 6000 to 12000 pounds. Maximum cutting speed is now 20 ft per minute.

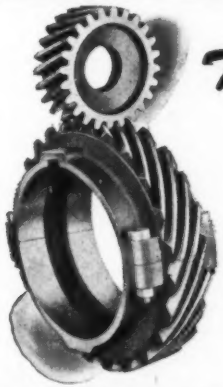
Made by Zagar Tool Inc., 23882 Lakeland Boulevard, Cleveland 17, Ohio.



FREE-MACHINING TOOL STEEL

Faster machinability is claimed for a new oil hardening tool steel announced by the Allegheny Ludlum Steel Corp., Brackenridge, Pa. The new product, identified as "Dunkirk EZ," is described as having many possibilities in the fields of cold work applications and tool steel machined parts, such as dies, gauges, forming rolls, bushings, liners and bodies for multiple-edge tipped tools.

The free-cutting qualities make it adaptable for tool steel parts turned out on screw machines and turret lathes. The comparative ease with which the new metal is worked provides longer life for the tools used in working it.



The **JOB** *nobody wanted—*

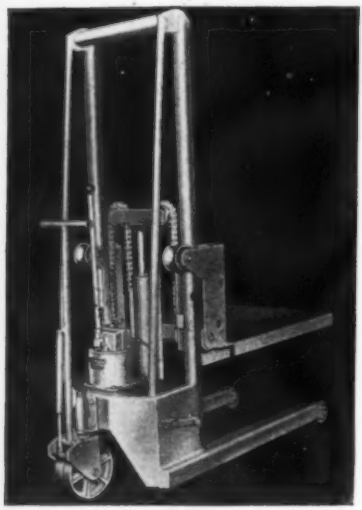
Unsuccessful shopping around for these special gears held a Swedish steamship in an American port for four months—

Until they came to "Atlantic." With our special equipment it was easy to cut the large helix angle and European module pitch required.

The job took five days, after which the ship went on its way rejoicing. Just another of those highly special, unusual, and sometimes difficult gear jobs that so often inspire the suggestion "Better try Atlantic Gear."

We have the equipment, the men, the "Know-how," and the desire to please. Why not try us? Send us your blueprints.

ATLANTIC GEAR WORKS
200-A LAFAYETTE ST.
NEW YORK 12, N. Y.
Phone: CAnal 6-1440



HYDRAULIC HIGH-LIFT TRUCK

Employing the same light-weight welded tubular and formed plate construction used in their 1,000-lb. capacity unit, Lyon-Raymond Corp., 2403 Madison St., Greene, N. Y. has added a 2,000-lb. capacity Hydraulic High-Lift Truck to the line.

Its light weight—about one-third less than conventionally designed portable elevators—makes the truck suitable for transferring materials, as well as for stacking and tiering.

Standard stock model has a platform 30" wide by 36" long with an elevating range from 6" to 60" above floor. Ease of movement is provided by Timken-equipped 10" diameter front and 5" diameter rear wheels. A foot-operated floor lock, making 2-point contact with the floor, will hold truck firmly in position when desired. A 2-speed hydraulic hand pump, as illustrated, is standard equipment, or a motor driven hydraulic pump may be furnished.

CARBIDE GAGE BLOCKS

Fonda Gage Co., Stamford, Conn., announces Tungsten-Carbide Gage Blocks. It is claimed, this is the first time a complete set of gage blocks meeting Bureau

The EYE-SPI MAGNIFIER

For VERNIER HEIGHT GAGES and LATHE MICROMETER COLLARS

A NECESSITY FOR INSPECTORS, LAYOUT MEN TOOL AND DIE MAKERS AND MACHINISTS

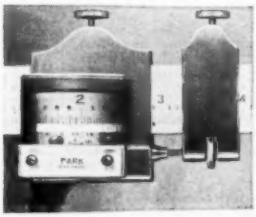
Models are available for Brown & Sharpe or Starrett calipers, height gages and gear tooth verniers. Also for South Bend, Logan, Atlas and Clausing lathes.

If you have a special visual problem, let us cooperate in developing a special Eye-Spi model for your needs.

EYE-SPI

Priced from $3.00 to $4.00

Distributors are wanted. Good territories open

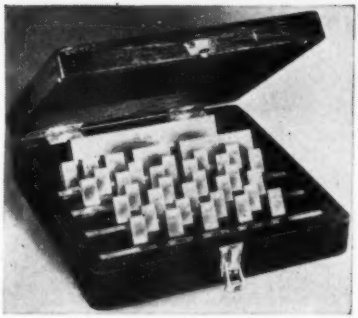


Just slip this clear plastic magnifier on that difficult-to-read scale and . . . SEE the difference.

- REDUCES REJECTS
- SPEEDS PRODUCTION
- MEANS ACCURACY
- MAKES READING EASY
- ENDS GLARE

Mail Your Order Now!

PARK METAL PRODUCTS
PRAIRIE VIEW · ILLINOIS



of Standards requirements has been manufactured from tungsten-carbide and offered for general use. Fonda Tungsten-Carbide Gage Blocks are manufactured in sets of 35 pieces, ranging in size from .001" to 4.000".

These blocks are said to have a wear resistance far greater than that of steel or chrome plated gage blocks. Fonda engineers predict that the users of Fonda Carbide sets will have no occasion to replace a Carbide Gage Block.

Due to the Ultra-Finish .2 to .4 micro-inch rms, the wringing qualities of these Gage Blocks are said to be superior and carbide blocks are corrosion-proof against moisture or fingermarks.

BERYLLIUM BULLETIN

An attractive two-color leaflet has been issued by The Brush Beryllium Co., 3714 Chester Ave., Cleveland 14, Ohio, to give comprehensive information on the advantages and applications of beryllium. Many illustrations are used in this two-color folder to cover the wide field of uses for these products. A unique cover dramatizes the atom of beryllium. Of simple atomic structure, it is the only light metal with a high melting point, and provides superior advantages for X-ray transmission and sound velocity.

No longer under allocation, beryllium copper alloys are available promptly as ingots, shot or powders. They are also available as rods, strip, sheet and wire and in the form of castings and various shapes.

Also described extensively are beryllium metal, beryllium aluminum alloys, beryllium nickel alloys and special beryllium alloys, as well as beryllium oxide as a high temperature refractory.

ATLAS and VULCAN

UNIVERSAL JOINTS NOW IN STOCK



The ATLAS



The VULCAN

The ATLAS Universal Joint, precision made completely from heat treated Alloy steels, has been serving industry for twenty years. The Vulcan Joint for use on Hoists, Power Take-offs and similar Equipment. There is no job too severe for the Vulcan. Featuring Alloy Steel drop-forged ends and oversize grease reservoir.

WRITE FOR CATALOGS.

THE GRAY AND PRIOR MACHINE CO.

620 Windsor Street **Hartford 5, Conn.**

Our west coast Representative: Link-Belt Company, Los Angeles, San Francisco, Portland, Seattle and Oakland.

AIR-RESTER DUST COLLECTOR



Standard Electrical Tool Co., 2486 River Rd., Cincinnati, O., has added to Air-rester line a new belted motor-driven Dust Collector. It is designed primarily for 25 cycle current but is also available for 60 cycle.

Specifications on the two sizes are: AR-14B with ¾-hp motor, 450 cfm and dimensions of 24″ wide x 19″ deep x 52″ high; the AR-24B with 1½ hp motor has capacity of 1000 cfm and dimensions of 24″ wide x 23″ deep and 59″ high.

This is a compact efficient unit used for collecting of dust from all types of grinding, buffing and polishing machines. The lower compartment contains the suction fan with motor, while the ample-size dust collecting chamber is located on top of stand. Dust-collecting chamber is fitted with filtering pads for arresting dust and allowing exhausted air to leave stand without perceptible dust, at low velocity and without creating any objectionable draft or air movement. There is a convenient clean-out door at side.

SEALOC NUT

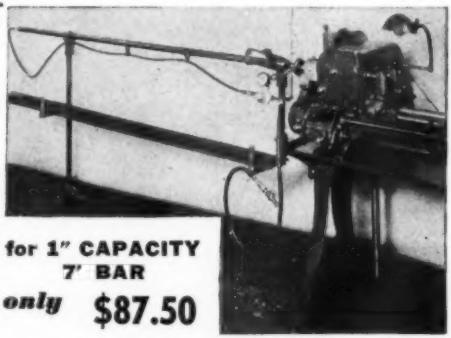
The Auto-Diesel Piston Ring Co., 3218 Superior Ave., Cleveland 14, Ohio, an-

Let **SERVALL**
increase your
NET PROFIT!
SERVALL
Pneumatic **BAR FEED**
SAVES *Payroll Cash on every Job!*

Don't Forget That. On every Job your operator will get out *more pieces* each hour.

MORE NET PROFIT
ON EVERY JOB

Every Production Lathe or Screw Machine needs this ServALL Bar Feed — Order it today. You'll say it is a Wise investment.



for 1" CAPACITY
7' BAR
only **$87.50**

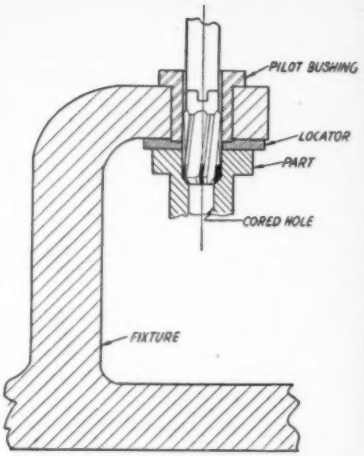
***We Built* SERVALL . . .**
TO INCREASE PROFITS
DISTRIBUTORS WANTED WRITE
ELLIOTT MACHINERY
6 E. Buena Vista **Detroit 3, Mich.**

nounces a new product that can be advantageously used in many places. The Auto-Diesel Sealoc Nut forms a seal and the design causes a compressing action, locking the threads to bolts and studs. It can be easily and quickly removed. The nuts facilitate production and assembly and also reduce service calls to a minimum. A circular describing this new product in greater detail will be mailed upon request.

TCT CARBIDE CORE DRILLS

Carbide-tipped core drills, specifically intended for use in drilling hard scaly cast irons such as rough cast exhaust manifolds, have been introduced by Tungsten Carbide Tool Co., 2661 Joy Rd., Detroit 6, Mich. The core drills are not carried as stock items, since dimensional requirements of different applications limit standardization to general design. The new TCT core drills are the result of a study of the effect of various carbide grades, tool shapes, shank materials, tool angles, number of flutes, etc., on the life expectancy of tools under such conditions.

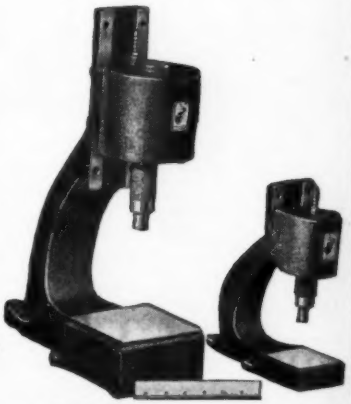
It is reported that the new drills are giving, in one application, a life of some 10,000 holes 1⅝" diameter, ⅝" deep, between grinds—equivalent to continuous production for seven days with two 9-hour shifts per day.

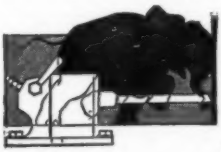


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AIR PRESS

The new Mead Air Press delivers 400 lbs. pressure on 100 lbs., line pressure. Handles many staking, crimping, assembly, and similar operations. Stroke of ram adjustable from 0" to 2". Maximum clearance 4". With foot control this press will speed up countless press jobs, save muscular effort. Write for new AIR POWER Catalog—just off the press.





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GRAND Speed QUIKCET VISE

Check These Features

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- Anvil top. Bottom screw clamp for quick shifting of vise.



QUIKCET VISE can be closed or opened in a jiffy. Simply push on jaw to close, and tighten with turn of handle. Balanced grip holds firmly.

OPENS INSTANTLY to full 3 inches by trigger release. Ready for further work without adjustment.

Write for Complete Catalog of Speed Clamps and Vises.

GRAND SPECIALTIES COMPANY

3132 W. Grand Ave. • Chicago 22, Illinois

SIZE CONTROL GAGES

Size Control Co., Division of American Machine & Gage Co., 4660 West Fulton St., Chicago, makers of reversible Go and No-Go plug gages, announce a twin line of reversible thread gages.



A new list of standard types with plain plugs of chrome, stellite, tungsten carbide, norbide and in sizes to .250" of sapphire is available.

These gages, designed to provide maximum gaging economy, feature green Go, and red No-Go ends, reversibility of plugs and six times longer service life (by grinding the worn leading edges). Steel plugs are furnished with a hardness of 62 Rockwell C, lapped to a finish of 1.50 micro inches. A new bulletin, No. 945, gives details.



This lightweight aluminum hand truck for the peacetime industrial market, weighs about as much as one of the 30-pound aluminum ingots stacked on its chassis. Virginia Gillen, a Northrop Gaines employee, stands by with a scale while the truck is test-loaded to 5330 pounds. These hand trucks are built by airplane fabricating methods developed by Northrop Aircraft, Inc., parent company of Northrop Gaines.

STAR LIVE CENTERS



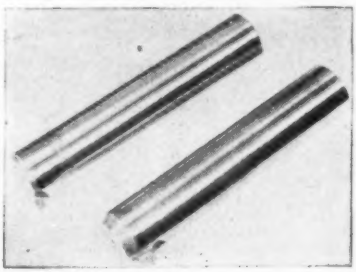
A new line of sturdy, compact live centers is offered by Samuel Gelber, 32 So. Jefferson St., Chicago 6, Ill.

Bearing the Star trade name, they are of the same dimensions as standard lathe centers and there is no overhang. Points are of hardened steel. Ball bearings are of the ground thrust type and a heavy duty bearing seal is employed.

They are available for Morse No. 1, 2 or 3 taper and overall dimensions vary from 2-3/16″ to 4½″, with overall diameters ranging from .475″ to .938″.

A new bulletin gives details and specifications and includes the Star line of static balancers.

TRI-BIT BORING BARS



Tri-Bits, the triangular shaped tool bits, manufactured by Weddell Tools, Inc., 1985 Main Street., East, Rochester 9, N. Y., have now been applied to boring bars.

One or more Tri-Bits are fitted into triangular holes, tying the body together all around the blade. The triangular tool bit is locked securely home into a vee by a single lock screw. The blade is further backed up and minutely adjustable by a single adjusting screw in back of the blade. The Tri-Bits, of high speed steel, cast alloys or carbide tipped may be reground in individual grinding holder and reset to size.

Boring Bars are made standard, with plain, straight or tapered shanks. They are also made special with plain or strip pilots integral in the body or in combination with other tools as facing or chamfering heads or hollow mills.

DUBL DUTY PLUG GAGE

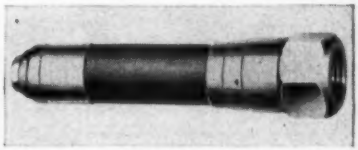


A recent addition to the line of precision tools made by Schrillo Aero Tool Engineering Co., 8715 Melrose Ave., Los Angeles 46, Cal., is the Dubl Duty Cylindrical Plug Gage. This gage has a light aluminum alloy collet-type handle which firmly positions a set of wire-type cylindrical plug gages. This unique type of handle enables user to reverse the gage member after it has worn under the allowable limit, and take full advantage of the unused gaging surface formerly in the handle. This feature increases the gaging life and lowers the cost per hole gaged. There are no tapers, no drift pins and no split handles.

Members are made of high grade tool steel, hardened, ground, plated and lapped, furnished out of stock in a size range of 1/16″ to 1″ in increments of 1/16″. Made to a commercial Y tolerance, and limits are established at plus and minus .0005″ from the basic figure.

HECO AIR BLOW GUN

The redesigned Heco Flex-Tip Air Blow Gun, now in production by the Hecketh-orn Manufacturing & Supply Co., Littleton, Colo., is adaptable to every purpose calling for application of air. Flexing the elastic tip, by pressure of thumb or finger, controls valve to release a delicate draught or steady, high-pressure stream. Connections are brass, except the hardened steel nose. The gun can be dropped, thrown or dragged without damage and is now available for ¼″ pipe thread.



EVERY ONE A "CHAMPION"

CHAMPION
EXPANDING MANDRELS

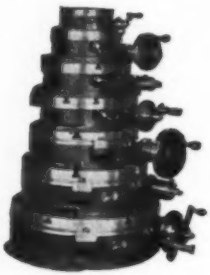
Twelve Champion Expanding Mandrels will do the job of hundreds of solid mandrels . . . completely and accurately filling any hole from ⅛" to 6½". The flexible round sleeve on the tapered arbor automatically sizes to the most minute variation. Save time and reduce costs with Champion Expanding Mandrels.



The Only Mandrel That Completely and Accurately Fills the Hole.

The WESTERN Tool and Manufacturing Co.
Louisville, Ohio

TROYKE ROTARY TABLES

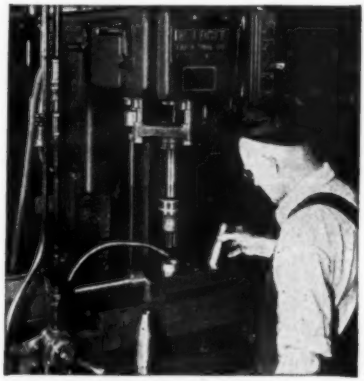


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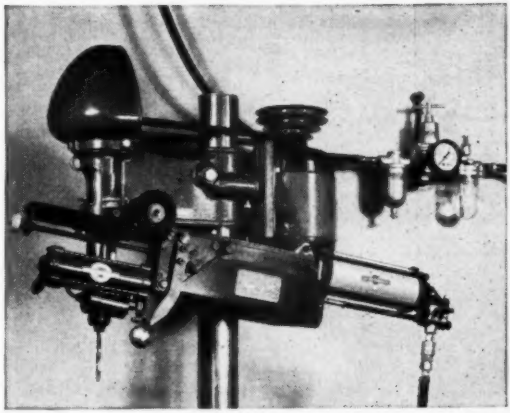
AIR OPERATED FIXTURES

Use of simple air-operated combination clamping and positioning fixtures on medium duty "Detroit" lead-screw tapping machines permits continuous high production precision tapping of even blind holes at Bowen Products Corp., Ecorse, Mich. It is reported that the loading speed and tapping accuracy resulting from the design of the simple two-position shuttle type fixtures permitted the tapping machines to operate on automatic-repeat cycles, relieving operators of the necessity of starting, stopping and reversing machines.



The process was worked out first in connection with the part shown—a 60 mm mortar shell. This part required a 1½" 12-NF thread ¾" deep at one end and a ⅝" 18-NF thread in a blind hole at the other end tapped to a critical depth in relation to an internal surface of the shell; both threads to be held in close concentricity to the OD. The equipment—designed and built by Detroit Tap & Tool Co., Detroit 12, Mich.,—comprised hand controlled air-cylinder and piston operated shuttling fixtures mounted on "Detroit" light (LTM) and (MTM) duty tapping machines, with two-piece work holders bearing on convergent vertical ways for clamping and horizontal locating and vertical positioning pins for accurate control of tapping depth. The taps for blind hole tapping were standard four fluted "Detroit" taps ground with a short chamfer, driven at approximately 70 ft/min. and guided by lead screws that were not subjected to the cutting torque.

BELLOWS-SENACON DRILL PRESS FEED



A new, "stepless-range power feed for use on drill presses, milling machines, surface grinders, etc., is being introduced by The Bellows Co. 861 E. Tallmadge Ave., Akron 10, Ohio.

Bellows-Senacon Feeds, at a touch of the handle, advance work or tools a pre-determined distance, under a pre-determined power thrust, and automatically return to starting position. Precision controls for feed and traverse rate, for power thrust, and length of stroke are simple and positive.

The new feed is powered by the Bellows Air Motor, and operates on any air pressure up to 160 lbs, delivering a power thrust approximately five times operating air line pressure. Feeding rate can be adjusted to fit perfectly the needs of stock or tool. Simple adjustment of the two throttle valves permits unlimited variation of feed and retraction speed in a stepless range. Advance may be so slow it is barely discernable, the return as fast as desired.

A smooth, steady feed, without whip, jump or backlash, is assured by use of the Bellows-Senacon Hydro-Check, a hydraulic resistance unit. The Hydro-Check serves to counter-act the natural "bounce" and "springiness" of air—provides a constantly maintained feeding rate regardless of fluctuations in stock hardness. The Hydro-Check may be used effectively in drilling operations to "check" the feed at the break thru, or may be set to provide a momentary "check" at bottom of the cutting stroke in blind hole drilling for greater-surface smoothness.

The Hydro-Check is not standard equipment, but is available in a range of six sizes to meet various stroke requirements.

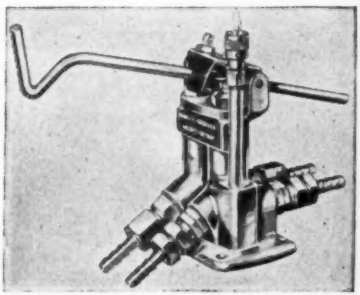
Bellows-Senacon Feeds are made in two sizes:—Model DF-60, using a 6" stroke Bellows Air Motor, which gives up to one revolution of the pinion shaft, and Model DF-90, using a 9" stroke Bellows Air Motor, which will give up to 1½ revolutions of the pinion shaft. Standard equipment includes air pressure regulator, gauge, oiler, filter, hose, fittings and quick coupler.

IMPROVED WELDIT GASAVER

A new and improved Gasaver, which is said to cut oxygen and acetylene consumption as much as 50 per cent, is announced by Weldit, Inc., 672 Bagley Ave., Detroit 26, Mich.

The new Gasaver has two important features not found in earlier models. First, it has a new non-smoking pilot light. Second, the lever rod—on which torch is hung between welds to shut off both gas and oxygen intake lines—is quickly adjustable as to length, so that any size or weight of torch will automatically operate the closing valves.

The new Gasaver, regardless of the weight of torch used, eliminates danger of open flame. Designated as the improved Model "E", it is listed as standard by Underwriters Laboratories.



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Screw machine products. Heat treated and ground if necessary. Improved and expanded facilities assure prompt and accurate service.
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MEAD JC-2 AIR COLLET

The Mead JC-2 Air Collet opens up a wider field of air power utility making this clean, quick power available for a wider variety of second operations, according to the Mead Specialties Co., 4120 North Knox Ave., Dept. P-6, Chicago 41,



Ill. Industrial plants who have used the smaller Mead Collet fixtures will be interested in learning Model JC-2 will hold bar stock up to 2½" with the same smooth, tenacious grip the smaller models have. With chucks, JC-2 will also handle shallow circular shapes up to 5" JC-2, like other Mead Collet models, can be used wet or dry. The coolant fountain, issuing thru the collet, lubricates, cools and washes away chips. By means of a pressure reducer, it will gently handle delicate parts. It controls by a pedal, leaving operator's hands free. The complete Mead Air Power catalog lists, describes the entire Mead line of pneumatic work-holding equipment.

A.S.A. *Jig*
DRILL BUSHINGS VIA AIRMAIL

Send for complete PEC Catalogue and Drill Bushing Conversion Data Chart (on your letterhead, please)

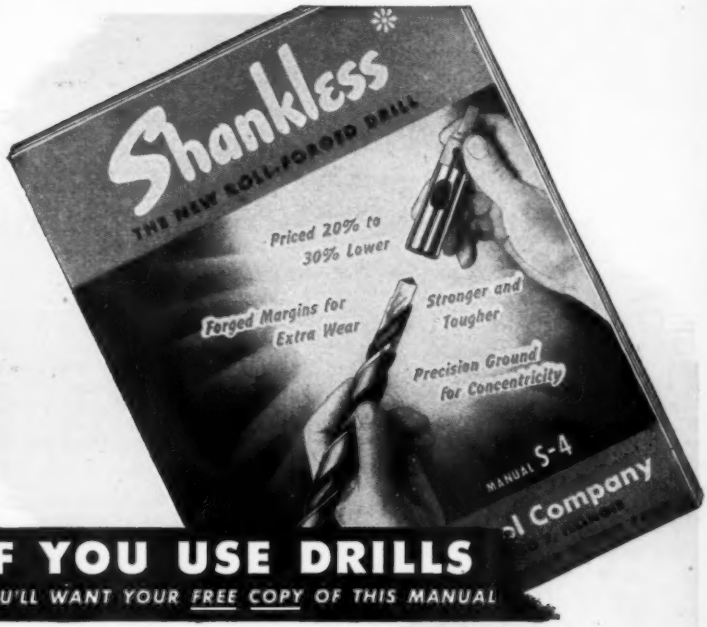
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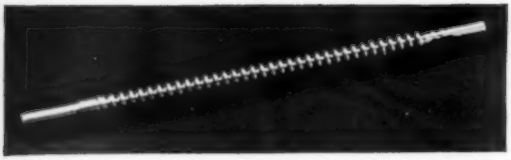
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WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF TWIST DRILLS



Here is the part being produced—a screw tab control drum.

An Unusual Threading Job

By GERALD ELDRIDGE STEDMAN

A SMALL Los Angeles machine shop did some great things, not only in the war effort, but it should be heard from in post-war growth. This is the Kay Mar Products Co., whose general manager is Willis C. March. The chief tool maker and shop superintendent is Harry Kurtz. For instance, they set some new records in the machining of a screw tab control drum from Navy 46-S-18 grade 7, type D stainless steel

The problem in the machining of this part (shown in Fig. 1) was to cut 4½" of ⅝-8 special 29° Acme thread. with a pitch diameter of .5575 to .5605" on a⅝" diameter bar. Their object was to whip the usual threading time and give equal or superior finish. Kurtz did it. Both ends of the part are larger than the root diameter of the thread. To further complicate the problem, the end at the starting point of the thread could not show tool marks. That took fine machining, and the maximum amount of imperfect thread at the stopping point (referring to the illustration) was one thread. Average time in the former routing was 18 minutes.

It should be explained perhaps, that this shop is known as a "pilot plant"; it receives such problems as this to establish costs, routing and methods.

The procedure of Kay Mar in solving this difficult threading problem was in this sequence:

They transferred the part to a lathe, as opposed to the usual threading machine. This lathe was equipped with an auto-



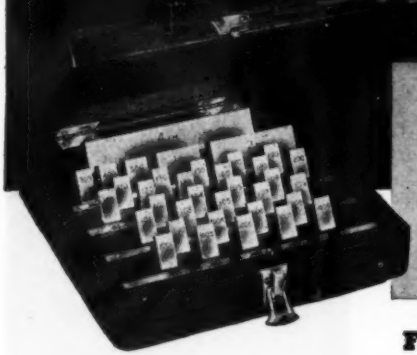
Partial view of Kay Mar Products machine shop. Man in foreground is doing high cycle milling on aluminum alloy forging at the rate of 19,000 surface feet per minute. Kay Mar is one of the many smaller machine shops that produced a great volume of machined parts as sub-contractors to large war producers in the Los Angeles area.

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THIS COMPLETE 35 GAGE BLOCK SET

In Carbide

Available with the Fonda "Ultra-Finish"



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Carbide **Gage Blocks are**
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- Wringing qualities far superior to those of steel blocks.
- Stability absolute—blocks will not change in size due to aging.
- Non-corrosive to moisture or fingermarks.
- Surface finish .2 to .4 r.m.s. or better.
- Size, flatness and parallelism equal to or better than Bureau of Standards' requirements.

Range	Steps	Pieces
.1001 to .1009	.0001	9
.101 to .109	.001	9
.110 to .190	.010	9
.100 to .500	.100	5
1.000		1
2.000		1
4.000		1
		35 blocks

The 83-Piece Carbide Set (83-C) has passed FONDA engineering tests and will go into production shortly. Orders accepted for future delivery.

PASSED HIGHEST TESTS DEVISED BY THE NATIONAL BUREAU OF STANDARDS

For greater accuracy! No worn gage blocks to replace! Far-reaching economies! FONDA's success in producing the first complete set of Tungsten-Carbide Gage Blocks offered to the public, marks the conclusion of several years of difficult experimentation — and the beginning of an improved new technique for gage block users. Write for all the details.

(Dept. F)

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CARBIDE OR STEEL *Gage Blocks*

44



Rear view of Kay Mar's device to cut threading time. Speed is indicated by smoke rising from the machine. Lower center is the automatic release which withdraws the tungsten carbide tool at the end of the cut and prevents thread damage.

matic release to withdraw the tool from the thread in ½ turn. Two five-pound solenoids with a one-inch throw, and three micro-switches were used to disengage the lead screw.

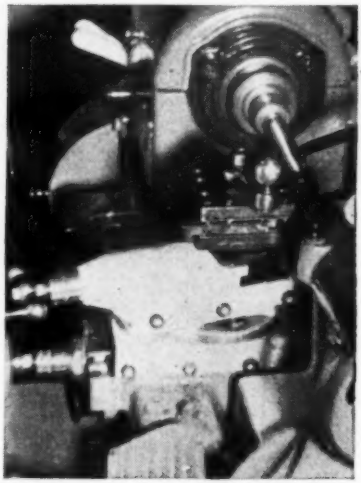
Another micro-switch was used as a stop for the carriage by disengaging the lead screw. The illustrations show the principle.

A final micro-switch was mounted at the point where the threading dial is usually positioned. The usual threading dial was removed and replaced with a cam having as many lifts as there were points, that the lead screw could be engaged, and to pick up any lead on any given thread.

On the screw tab control drum, which occasions this particular report, Kay Mar could have used 16 lifts on the cam. But because of the machine speed, it was only esesntial that four be employed. The lift of the cam in this example, contacts the second micro-switch, mounted as stated at the point where the threading dial is customarily positioned. This lift of the cam is energized by a third micro-switch which is wired in series with the second switch.

To operate this setup, the compound dial is set for the depth of cut. The operator touches the energized micro-switch which causes response of the second switch.

When the cam touches this switch, the first solenoid engages the lead screw and sets the cross slide into position. Carriage of the lathe travels down the ways for the full length of the thread. When it cuts the thread length, the tool automatically withdraws.



Closeup of Kay Mar's device to cut threading time.

When the tool point has cleared the outside diameter of the part, the carriage contacts the third micro-switch and the second solenoid disengages the lead screw. The cycle is repeated until the full depth and pitch diameter of the thread are reached. This particular part (screw tab control drum) was completed by this technique, in this sequence, in 22 cuts. Total time for 9000 parts, let us say, including loading and unloading the machine and checking the parts, was five

minutes per part. Before this, nothing better than 18 minutes had been known.

Perhaps something should be said about the type of cutting tool used. Kay Mar employed a special tungsten carbide tool bit . . . . with not more than two degrees clearance at any point on the tool over the helix angle of the thread. This is distinctive in itself. The top of the tool had only three degrees negative rake.

The finish cut on this screw tab con-



Reduction of threading time from an average of 18 minutes per part to 5 minutes' cutting time for each thread, is accomplished by the Kay Mar device, which has a spindle speed of 1500 rpm. Machine is shown ready to start with operator's finger on the button. Two solenoids are below her hand and back of the carriage is the automatic release.

trol drum required a separate tool, synchronized in a square turret with the roughing tool. In reality, there were two roughing tools and two finish tools used to accomplish this result.

The machine operator (by the way, a woman) used two tools for the pre-determined run of pieces. Then the tools were converted to a second set of roughing and finish tools. The number of



Turning out threaded studs from manganese bronze at Kay Mar.

pieces per grind averaged 55 per set of tools on 9000 parts. The operating time of five minutes per part included the tool maker's setup of the square turret.

To assure constancy of production, a tandem square turret was kept equipped. On all four tools used, Kay Mar found that 70 parts could be run out on one set of tools before the thread form showed error. They use a comparator to indicate an error of .0001". Because of the fidelity of March and Kurtz to precise machining methods, tools were changed after each 55 pieces to avoid any possibility of error. The machine speed achieved was 1500 rpm, or approximately 260 surface feet per minute.

The history of this particular job indicates that a pilot plant operation is sound, particularly when two vitally concerned men are in charge of it.

My observation on threading with experienced help doing the job indicated that rejections averaged about 4.5 per cent. The Kay Mar method in this improved technique reduced rejections to where they averaged less than .5 per cent, employing semi-skilled labor.

Of course, this reflects itself in the cost of the completed part. In this instance, and as a result of improved machining, Kay Mar cut the cost of thread cutting over 65 per cent.

AS *Quick* AS YOUR EYE!

UNITED PRECISION'S
NEW Colored PLASTIC COLLETS
Identify "GO" AND "NO-GO" GAGING MEMBERS

GREEN for "GO"

RED for "NO GO"

New light, tough *Plastic* Collets reduce weight, provide more secure locking. Non-corrosive. Pushed out only by drift. Gaging members not marred nor scratched as by metal.

DUBLIFE

REVERSIBLE PLUG GAGE

Two "Go" and two "No Go" ends in same handle. When either becomes worn, reverse and you have new gage. UPPCO-Lapped, or Chrome-plated, UPPCO-Lapped. NEW LIGHT-WEIGHT HANDLE. Enables removal of "Go" or "No Go" in one simple operation.

United Precision Products Co.
3522 W. Belmont Ave., Chicago 18

Other Gages of A. G. Design. Send for Complete Catalog.

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WARTIME GLASS PRODUCTS

Indications of the important role that glass will play in the nation's peacetime economy are revealed in an exhibit of war-time glass products being held in the home offices of the Pittsburgh Plate Glass Co., Pittsburgh, Pa. The display represents nearly a quarter of a century of normal advance in technical development, most of which was compacted into the last four years.

While the bulk of products in the current exhibit are concerned with aviation there are many items which have proven to be 'life-savers' in other fields. Various types of curved glass dials, with finely calibrated lines and finished to remarkably close tolerances for use on submarines are included.

The story of progress as revealed in the exhibit is all the more impressive in view of the fact that the glass technicians practically started from scratch in developing new products, particularly in the aviation field.

Current trends indicate that post-war use of glass in the industrial, commercial, and domestic fields will be much greater than in the pre-war years. For example, windows for new homes will be larger and many will be double-glazed units. Store-fronts and exterior of other commercial buildings will adopt the open-front type exterior which employ an invisible wall of weather-protecting plate glass between interior and exterior.

Use of glass tanks will be expanded in industrial fields where other glass applications will include special control booths for steel mills, mirrors for controlled production and extensive use in buildings and equipment of the new cellulated, inorganic insulation called Foamglas.

Glass has been found to fulfill the requirements of many jobs in industry.

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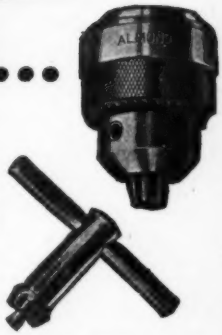
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The Almond Three-Jaw Drill Chucks were pioneers in the field of drill chucks. Since 1872 they have played a necessary part in the logical procedure of machine development.

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OPERATIONS ON TUBING

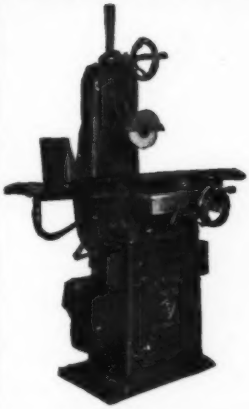
Tubing is highly important in industry and has many operational aspects. Seamless tubing is of particular value in making certain items for which tubing incorporating a seam would not do. The manufacture of steel bushings is a case in point. In some places where steel bushings have been made in large quantities from seamless tubing, the inside of the bushings has been finished by a broaching operation, on a full-automatic broaching machine, for which no operator is required.

The pieces of tubing to be made into bushings are fed from a cutting-off machine, to a tube on the front of the broaching machine, which serves as a magazine. There is an automatic slide below this tube-type magazine, which moves back and forth, under hydraulic control, to carry bushing blanks from the magazine to broaching position. As a blank is placed in broaching position, the broach is raised by a hydraulic cylinder in the lower part of the machine, the top end of it passing thru the bushing blank, and connecting to an automatic pull-head above.

This pull-head then pulls the broach completely thru the work, lifting it out of the lower broach receptacle as it does so. Thus, the broached bushing is left free, and slides down a chute, after the broach has passed entirely thru the piece. The rams then immediately return to the starting position. The broach is returned to the lower broach receptacle, and loosed from the automatic pull-head at the top, while the automatic slide is retreating to the magazine and bringing forward the next blank to be broached.

Various methods are employed for cutting off tubing. Something depends on the diameter of the tubing, the thickness of the tube wall, the material from which it is made, the amount to be cut and other factors. Interesting is a method where fifty nested pieces are cut off at one pass.

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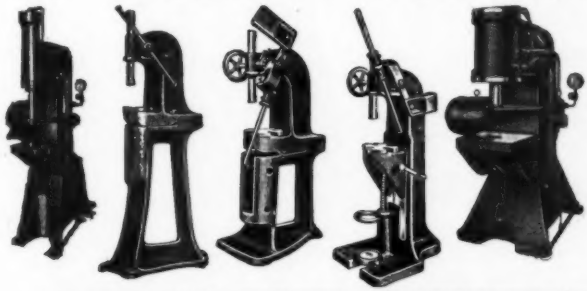
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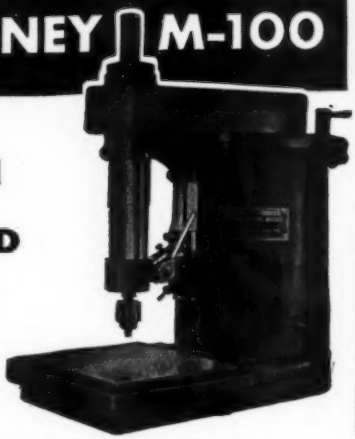
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Completely enclosed parts insure operator safety and sealed ball bearings give smooth performance in 4,000 to 10,000 standard speed ranges, with additional ranges available. M-100 is produced in models from 1 to 6 spindles.

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CUTTING ELECTRODES

An improved type of cutting electrode, permitting greatly increased speed in metal cutting and for use at unlimited depths underwater, has been released by the Ellwood Products Corp., Ellwood City, Pa. So designed that any unskilled workman can successfully cut metal after only ten minutes' instruction, the Ellpro Electrode was developed primarily to permit the U. S. Navy to salvage damaged ships that are endangered by large masses of bent and twisted armor plate which prevent their proceeding to navy yards for repairs.

The Ellpro Electrode is made of steel in the form of a hollow tube with an adhesive type coating which prevents it from sticking to the cutting surface. It is used with oxygen, which permits safety to the user at any depth underwater, whereas other methods of cutting become dangerous as the depth and pressure increase.

The adhesive coating was developed thru cooperation, research and exhaustive testing with the U. S. Naval Engineering Experiment Station at Annapolis and the Minnesota Mining & Mfg. Co. Over two years were spent in experimentation on hundreds of different types of coatings, and the adhesive type most successfully met all requirements under the most difficult conditions.

With the new Ellpro Electrode, a molten arc is obtained the instant it is placed against the surface to be cut. It can be used successfully underwater or anywhere on land, with either a-c or d-c current. A torch holder, perfected for use with the Electrode, prevents it from burning down to a point where it cannot be removed with ease. As its cutting life ends, it can simply be drawn from the holder and a new one inserted with practically no loss in time.

Although the Electrode was designed primarily for underwater cutting, it is easily adapted to cutting scrap iron or steel, salvaging marine equipment, etc.

THE *New*

DEARBORN MODEL "B" CHUCKING and INDEXING FIXTURE

FOR USE ON MILLING MACHINES

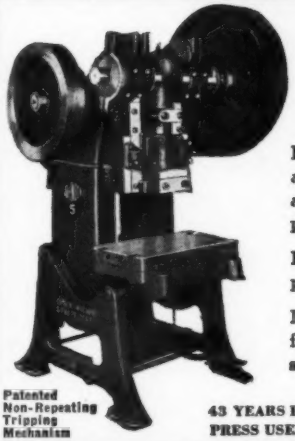
The Dearborn Fixture meets the demand for automatic chucking and indexing, permitting several operations on the same piece with only one setting. Its simplicity of design, high precision, milling accuracy and speed of operation has led to its adoption by many of the leading manufacturers thru-out the country.



Work held by automatically opening and closing collets. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces.

Write for Folder

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CENTRIFUGAL FORCE IN DESIGN

Since so many different machine elements are rotary, it is a simple matter to use centrifugal force for the performance of different functions. Centrifugal force will cause movable parts of any considerable weight to be thrown outward, along any radial path in which they are free to move. Various clutches have been designed, which are known as centrifugal clutches, because they incorporate this principle. They usually have a cup-type member of some kind, against the inside of which the weight-members are thrown. Such clutches have particular value for application in starting relatively heavy loads gradually, when applied to motors, or to high-speed internal-combustion engines.

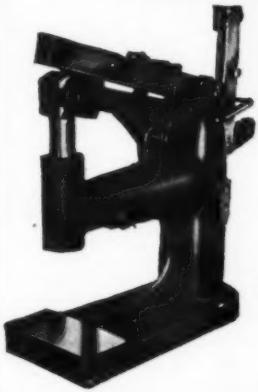
There need not be a cup-type member, however. Weights thrown outward by centrifugal force need not move in a direction truly radial. They operate efficiently in any near-radial path. Consequently, plate-type centrifugal clutches can be used, if desired.

One centrifugal clutch has a driving plate, which is keyed to the shaft of the motor or engine. A movable plate is assembled with it, and the movable plate carries a pulley, sheave, sprocket or gear, as may be desired. The keyed plate drives the movable plate thru a time-lag device and centrifugal weights.

It is evident that the power resident in a centrifugal clutch becomes greater as speed increases. Therefore, a given load is only picked up in proportion as the speed of the prime mover builds up. Engineers familiar with centrifugal design can always find a way to govern the factors of time, torque and acceleration, in centrifugal clutches.

Centrifugal force can be made to release a load, as well as to pick one up. In the automatic screw machine, where chucking action is used to tighten the collet on the rod or bar, fulcrummed fingers are operated by a sleeve or chucking spool, to exert the required endwise pressure on a collet closing device.

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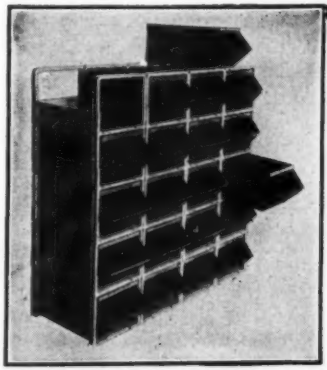
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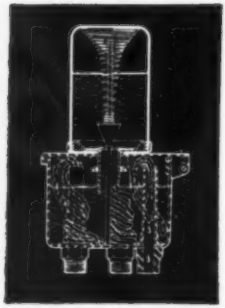
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MODERN WELDING TECHNIQUES

Welding will play an important role in America's industrial future as a means of fast production and of making possible the streamline designs that engineers are projecting for consumer and industrial goods of the future, according to Charles H. Jennings, research engineer with the Westinghouse Research Laboratories. Welding principles tested in the war program will enable experts to meet and solve the many welding distortion problems of the peacetime production line, he believes.

The engineer terms distortion one of the major problems of welding. Heating and cooling of the metal within the area being welded, and the contraction of the filler metal during the cooling period causes the fabricated structure to shrink or warp.

However, by properly studying the fundamental factors producing distortion and applying corrective measures — clamping the parts in fixtures during welding, pre-distorting the parts to compensate for expected distortion, or developing special welding techniques — distortion can often be held to a low point or eliminated.

War-needed tanks, guns and other armaments were saved from the scrap heap and rushed to our fighting forces through the ability of welding engineers to overcome problems of distortion. In one instance, 100 gun parts were saved by welding on additional metal.

Although seemingly a simple solution, it required a full knowledge of welding theories and application to make this particular job possible, Mr. Jennings declares. The more difficult problems of distortion are caused by the welding process itself, which thru its very nature causes fabricated parts to shrink and warp.

The construction of an all welded ship calls for a pre-determined sequence in the welding of the metal plates so that the stresses built up during fabrication will be balanced. The same problem is true of small assemblies.

MAQUOKETA COMPANY "Suggests"

in planning for production or maintenance."



Saw More
METAL CUTTING MACHINES

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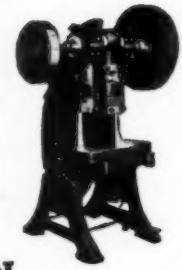


★ Here is one of six Federal Presses in operation at the Wadsworth Watch Case Co., forming tiny bearing parts. "These operations are of a most exacting nature," says Wadsworth, "and demand that work be held at very close tolerances." An example of Federal Press *accuracy* —typical of many other specialized jobs these versatile presses are performing in hundreds of plants today. Write for latest catalog.

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PRESSES

AVAILABLE IN 8 SIZES— CAPACITY, 6 TO 80 TONS

PLANE MAINTENANCE

Today the domestic airlines of the United States are flying 525,304 miles a day and their planes are averaging 11.39 hours per day in the air. Much of this gain must be credited to the efficiency of the maintenance departments of the airlines, according to the Air Transport Association of America. These departments have adapted to their overhaul work devices as varied as the X-ray and a barber's chair.

The super eye of the X-ray is being used by one airline to examine the wings of planes and locate hidden cracks in structural members.

One of the airlines has developed a 3-wheeled portable engine stand, which not only cuts plane overhaul time, but increases the safety factor for the mechanics on this job. Another airline has reduced engine overhaul and maintenance time by replacing all rigid aluminum pipes with a flexible hose with fire-resisting qualities.

Seed blasting is used by many airlines to clean engine parts, as it allows the blasting of the entire engine without any damage to the softer metals and also eliminates a lot of hand work that used to be needed when the parts went thru a tank-cleaning process.

One airline uses an air cylinder to remove piston pins, removing them in one-tenth the time needed by the screw type pusher. This air cylinder also is used in replacing the pins.

An airline that used to hand polish with emery cloth all engine parts and have each mechanic polish the parts of an engine on which he was working, now uses a polishing wheel, and one man can polish all the necessary parts of an engine in 1½ hours, saving two man hours per engine.

To insure keeping planes in the air for a maximum number of hours daily many airlines use group assemblies for replacement. Anyone of these assemblies may be completely removed or installed in an operating condition. Stands to test conditions in planes under simulated flight conditions have been developed.

ERRINGTON MECHANICAL LABORATORY

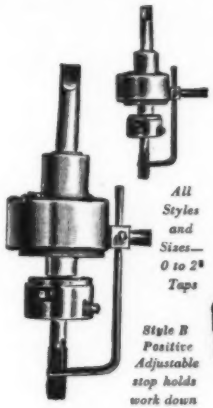
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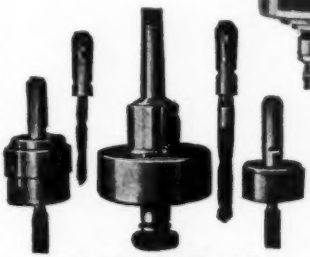
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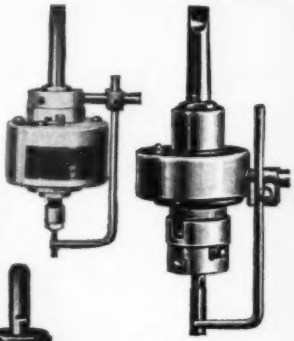


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BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model E.L. 12" Table.

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American
DIAMOND TOOL & GAUGE CO.
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WAR USES OF FELT

The important role played during the war by the felt industry is not realized by the average person. Since 1941, hundreds of new uses have been found for wool felt, largely because of its unique properties, which make it available as a substitute or alternate for scarce materials. Rubber—both the spongey and hard, tougher types—is an outstanding example, for great quantities of rubber were released for Army, Navy, lend-lease and much manufacture of war materiel, through the substitution of felt. In some cases this fabric has been made to serve hitherto unheard of purposes by impregnating, coating or laminating with plastics and other substances, while "rock hard" felt wheels and bobs for grinding and polishing processes also were welcome where other grinding materials were unobtainable in sufficient quantity. Its use has ranged from filters in tiny hypodermic needles to providing cushioning in rocket bombs.

For long periods, engineers of felt companies were in almost daily contact with government and war contract manufacturing agencies beginning long before Pearl Harbor. The result of this study of demands and improving and adapting felt for new applications revealed much that will be of value in manufacture of civilian goods. Through the broader knowledge gained, there has been added a widespread acquaintance of the thinking in industries which previously used this product in only limited ways, or not at all.

Making prompt use of the greater perspective obtained during the war, and aided by additional manufacturing facilities and improved techniques acquired during the last few years, the industry is now extending its standardization program and also carrying forward research in individual laboratories.



AVOID SHOP TIE-UPS with the LINLEY

There's a hurry-up demand today . . . and more coming . . . for a great quantity of small jobs like dies, jigs, fixtures, metal patterns, models, etc. Such work can tie a busy shop in a tight knot . . . unless the right type of equipment is on hand to shoulder the burden. The LINLEY Vertical Milling and Jig Boring Machine is one very definite answer to that problem.

It's compact, sturdy . . . has 8 speeds to 4250 r.p.m., velvet feed, generous (7" x 17½") table top . . . and takes but 2½ Sq. Ft. of floor area.

Can't tell the whole story here . . . but it will pay you to investigate . . . pay you in low costs. Send for Bulletin.

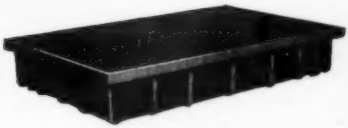
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VICTOR'S BARGAINS IN TUNGSTEN CARBIDE TIPPED TOOLS

Price $.90 Each In Any Size

New Low Prices — Increase Production — Cut Operating Costs

Tools are tipped with Tungsten Carbide and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials (such as hard rubber, bakelite, fibre), and tough alloy steels up to 500 Brinell hardness.



Left — 100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½



Right — 200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

Below — 300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½



STANDARD TUNGSTEN CARBIDE TIPPED TOOL BITS

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lot of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

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2	¼	5/8	2.77
2	3/8	5/8	3.02
2½	¼	7/8	3.40
2½	5/16	7/8	3.59
2½	3/8	7/8	3.78
2½	7/16	7/8	4.15
2½	½	7/8	4.15
3	3/16	1	4.10
3	¼	1	4.10
3	5/16	1	4.35
3	3/8	1	4.54
3	7/16	1	4.79
3	½	1	5.04
4	3/16	1	5.67
4	¼	1	5.67
4	5/16	1	6.36
4	3/8	1	6.36
4	7/16	1	7.12
4	½	1	7.12
4	9/16	1	7.75
4	5/8	1	7.75
4	¾	1	8.38
4	7/8	1	10.00
5	3/16	1	10.00
5	¼	1	10.00

Diameter Inches	Face Inches	Hole Inches	Our Net Price Each
5	5/16	1	$10.00
5	3/8	1	10.00
5	7/16	1	10.00
5	½	1	9.51
5	5/8	1	10.52
5	¾	1	11.46
5	7/8	1	13.42
5	1	1	13.42
6	3/16	1	12.50
6	¼	1	12.50
6	5/16	1	12.50
6	3/8	1	12.50
6	7/16	1	12.50
6	½	1	12.41
6	5/8	1	13.92
6	¾	1 or 1¼	15.12
6	7/8	1 or 1¼	17.89
6	1	1 or 1¼	17.89
7	½	1 or 1¼	18.00
7	5/8	1 or 1¼	18.00
7	¾	1 or 1¼	21.67
7	1	1 or 1¼	25.39
8	½	1 or 1¼	25.00
8	5/8	1 or 1¼	25.00
8	¾	1 or 1¼	28.00
8	1	1 or 1¼	33.64

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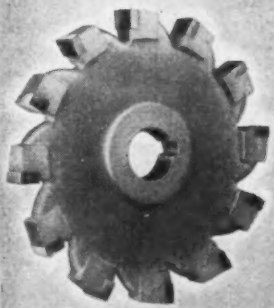
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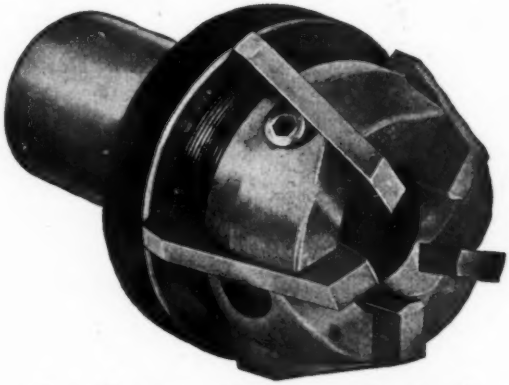
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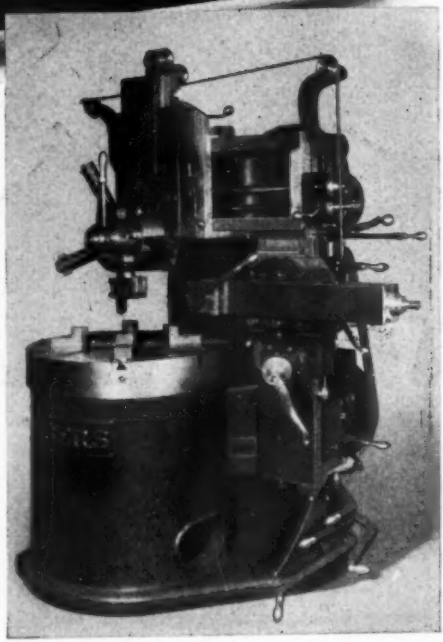
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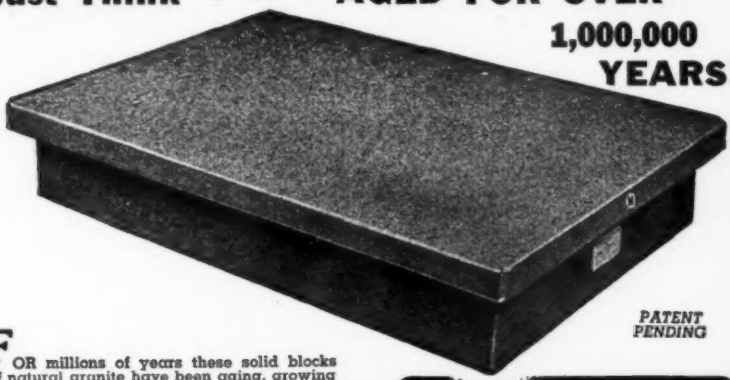
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PRODUCTS ADVERTISED IN THIS ISSUE

Abrasive Cloth, Paper, Disc, Belts, Stones, Etc., 54, 74, 190
Adaptors, 201
Air-Operated Equipment (Look for specific item)
Alloys, 248
Angles, 202, 220, 256, 444
Arbors, 143

Balancing Machines, 344
Balancing Ways, 251
Bearings, Ball, 422
Bearings, Roller, 422
Bearings, Thrust, 186
Belt Fasteners, 174, 190
Belt Lacing Equipment, 190
Bending Machines, 101, 265, 309, 339
Boring Bars, 71, 110, 256, 270, 271, 291, 322
Boring, Drilling and Milling Machines, Horizontal, 145
Boring Heads, 279
Booths, Accoustic, 356
Brakes, Press and Bending, 101
Brazing Equipment, 83
Broaches, 46, 118, 266, 286, 293
Broaching Fixtures, 90
Broaching Machines, 118
Burring Machines, 228, 241
Bushings, Drill Jig, 70, 71, 222, 349, 358, 410

Calipers, 226
Carbide Tools, 4, 26, 35, 41, 81, 83, 87, 90, 110, 117, 137, 150, 263, 277, 300, 317, 357, 430, 435, 444, 449
Center Drives, 163
Centers, Bench, 183
Centers, Lathe, Planer, Miller, Etc., 52, 73, 112, 150, 298, 351
Chucks, Collet, 71, 108
Chucks, Drill, 24, 25, 417, 437
Chucks, Lathe, 14, 164, 193
Chucks, Magnetic, 51, 193, 289
Clamps, 94
Cleaners, Vacuum, 369
Clutches, 209, 238, 259, 355
Collet Fixtures, 130
Collets, 24, 25, 111, 264, 374, 394
Comparators, 21, 58, 185, 385, 447
Compressors, Air and Gas, 83
Contouring Machines, 390
Controlling Devices, 28, 147, 168, 175, 289, 367
Coolant Systems, 133
Counterbores, 105, 110, 283, 327, 436
Counting Devices, 208, 296, 391
Countersinks, 67, 300
Couplings, Air, 171, 290
Couplings, Flexible, 206, 337, 374
Cut-Off Machines, 34, 96a, 99, 276, 425
Cut-Off Wheels, 54, 55, 194, 195
Cutters, 4, 297, 319, 363
Cutters, Hole, 48, 89, 283
Cutter Sharpening Machines, 31, 252
Cutters, Milling, 35, 41, 110, 137, 239, 263, 273, 277, 297, 300, 319, 381, 431, 435
Cutters, Rotary, 137
Cylinders, Hydraulic and Pneumatic, 165, 175, 182

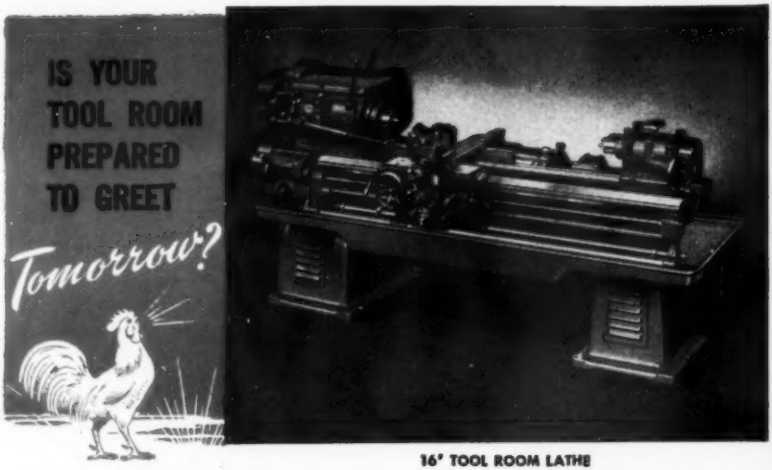
Degreasers, 317
Demagnetizers, 160, 188, 193, 367
Diamond Powder, 204, 236
Diamonds and Diamond Tools, 107, 158, 191, 236, 244, 307, 317, 325, 417
Diamond Wheels, 54, 55, 236, 417
Die Heads, Threading, 36, 334
Diemakers' Supplies, 91
Die Making Machines, 31, 362, 427
Die Set Pullers, 91
Dies, Front Cover, 181, 315, 367, 445
Die Sets, 261, 294, 369
Dividing & Indexing Heads, 113, 134, 193, 225
Dressing Fixtures, Grinding Wheel, 191, 345
Dressing Tools, 107, 191, 307, 325
Drill Bits, 117
Drill Heads, 43, 226, 257, 371, 378
Drill Jigs, 230
Drilling Machines, Multiple Spindle, 6, 16, 96a, 100
Drilling Machines, Radial, 100, 131
Drilling Machines, Vertical, 6, 16, 96a, 131, 339, 361, 420
Drills, Center, Core, Twist, Square, Etc., 83, 89, 300, 411, 432
Drills, Portable Electric, 45, 72, 76, 120, 237, 321
Drills, Portable Pneumatic, 23, 88, 109
Drives, Chain, Back Cover
Drives, Motor, 86, 162, 188, 196, 229, 275, 305, 348, 351, Back Cover
Dyes, Layout, 340, 365, 400
Duplicating Machines, 149
Dust Control Equipment, 14, 96, 253, 452

Engineering Charts, 186, 211
Etchers, 160, 244, 367
Ethylecellulose, 386
Eye Bolts, 223

Feeding Devices, 128, 367, 404
Files, 93, 161, 352, 383
Files, Portable Electric, 228, 241
Files, Rotary, 15, 67, 77, 97, 161, 189, 303, 252, 397
Filing Machines, 51, 228, 294, 362, 427
Filters, 12, 50, 66, 299, 367
Finishing Machines, Abrasive, 125
Flexible Shaft Equipment, 15, 147, 205, 303, 397
Forming Machines, 237, 251
Furnaces, Heat-Treating, 22, 49, 106, 237, 350

Gage Blocks, 51, 221, 413
Gage Handles, 156
Gages, Front Cover, 17, 58, 75, 79, 132, 152, 156, 159, 166, 177, 181, 185, 227, 266, 267, 293, 329, 332, 349, 355, 361, 368, 373, 385, 389, 395, 413, 416, 428
Gear Cutting Machines, 7
Gear Hobbers, 375
Gears and Gear Units, 314, 348, 361, 371, 372, 401
Grinders, Abrasive Belt, 96a, 129, 312, 318, 326, 382
Grinders, Air, 23, 396
Grinders, Bench, 387
Grinders, Carbide Tool, 31, 96a, 372, 387, 437
Grinders, Centerless, 8, 9
Grinders, Chucking, 395
Grinders, Cutter and Tool, 31, 96a, 252
Grinders, Cylindrical, 8, 9, 80, 122
Grinders, Disc, 36

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Grinders, Drill, 21, 184
Grinders, External, 86, 240
Grinders, Gear, 47, 122
Grinders, Internal, 86, 240
Grinders, Knife, 388
Grinders, Pedestal, 96a, 198, 387, 452
Grinders, Portable and Tool Post, 198
Grinders, Portable, 32, 45, 72, 109, 194, 195
Grinders, Profile, 40
Grinders, Special Purpose, 36, 47, 122, 315
Grinders, Surface, 20, 40, 51, 96a, 122, 224, 242, 335, 419, 453
Grinders, Swing Frame, 288
Grinders, Tap, 96, 156, 180, 267, 315
Grinders, Tool, 372, 453
Grinding Wheels, 36, 54, 55, 154, 187, 194, 195
Guide Line Lights, 214
Guides, Saw, 335
Guns, Air, 162, 299, 367, 380

Hammers, 280, 292
Hammers, Portable Electric, 23, 321
Hand Tools, Power (Look for specific item)
Hardness Testing Devices, 218
Heads, Multiple, 399
Heating Equipment, 360, 386
Hinges, 369
Hobs, 381
Holders, Die, 245, 283
Holders, Reamer, 411
Holders, Tool, 4, 284
Honing Machines, 92, 228, 241, 269
Hydraulic Equipment (Look for specific item)

Indicators, 82, 177, 184, 281, 296, 355, 428
Inspection Devices, 17, 75, 79, 159, 177, 185, 221, 225, 281, 306, 341, 355, 385, 447

Jig Borers, 62, 143, 230, 429
Jigs and Fixtures, Front Cover, 341, 381, 421
Joints, Universal, 78, 403

Keyway Cutting Machines, 180, 184, 292
Knurls, 126, 310, 314

Lapping Compound, 322
Lapping Machines, 228, 241, 269
Lathes, Automatic, 11, 38
Lathes, Bench, 2, 3, 126, 139, 179, 249, 343, 366
Lathes, Engine and Toolroom, 2, 3, 13, 38, 104, 124, 139, 151, 179, 249, 343, 373, 441
Lathes, Polishing, 148
Lathes, Speed, 275, 359
Lathes, Spinning, 299
Lathes, Turret, 11, 21, 231, 438
Layout Materials, 340, 365
Lift Trucks, 158, 371, 384
Lighting Equipment, 286
Locating Tools, 274, 281
Lubricants, 153, 246, 255
Lubricators, 12, 37, 424

Machines, Reaming, 365
Magnetic Blocks, 365, 393
Magnifiers, 402, 447
Maintenance Materials, 212, 381
Mandrels, Expanding, 278, 408
Marking Devices, 68, 331, 336, 353, 371, 373, 410
Micrometers, 177
Microscopes, 447
Milling Attachments, 235
Milling Machines, 143, 157, 169, 176, 249, 339, 346, 369, 429, 438, 443
Mills, End, 105, 266
Mills, Hollow, 288, 436
Motors, 44, 86, 275
Motors, Outboard, 315

Nibblers, 319, 321
Numbering Devices, 336, 353, 371, 373, 410
Nut Setters, 337

Oil Germicides, 353

Pans, Tote, 184, 406, 423
Photocopying Machines, 354
Plastics, 10
Plates, Surface, 202, 220, 256, 333, 347, 349, 429, 439
Polishing Machines, 359, 363
Positioners, 234

Presses, Air, 405
Presses, Arbor, 405, 419
Presses, Hydraulic, 39, 103, 197, 419
Presses, Power, 421, 426
Presses, Punch, 6, 114, 116, 207, 351, 392, 421, 426
Profilers, 126, 390
Pumps, 88
Pumps, Coolant and Lubricant, 133, 247
Pumps, Hydraulic, 39, 46
Punches, 116, 367
Pyrometers, 186

Reamers, 83, 87, 105, 110, 150, 271, 304, 357, 365
Rectifiers, 289
Reel Stands, 128
Refrigerating Equipment, 115
Regulators, 299, 365
Retaining Rings, 63
Riveting Machines, 216, 331, 382, 423
Rolling Mills, 59, 351

Safety Equipment, 318, 367, 381, 398
Sanders, Portable Electric, 45, 72, 228, 241, 363
Sanding Machines, 318, 363, 385
Saw Blades, Band, 42
Saw Blades, Hack, Inside Front Cover
Saw Sharpeners, 315
Sawing Machines, Band, Inside Front Cover, 127, 294
Sawing Machine, Circular, 34, 300
Sawing Machines, Hack, Inside Front Cover, 61, 193, 293, 363, 425
Saws, Band, 51, 96a, 127, 131
Saws, Portable Electric, 45, 232, 228, 241
Scrapers, Hand and Power, 228, 241, 345
Screw Drivers, Portable Electric, 76
Screw Drivers, Portable Pneumatic, 32, 76
Screw Drivers, Power, 323
Screw Machines, 27, 111, 213
Screws, Cap, Set, Socket and Machine, 60, 170
Screws, Transfer, 188, 246
Services: Milling, Grinding, Lapping, Rebuilding, Repairing, Business, Etc., Front Cover, 95, 121, 260, 286, 293, 315, 329, 367, 371, 379, 410, 433, 445
Shapers, 7, 37, 123
Shearing Machines, 6, 123, 319, 321, 363
Shears, Portable, 45, 188, 309, 347, 378
Silver Solder, 85
Sine Bars, 341, 392
Soldering Equipment, 315
Spacers, 148
Speed Reducers, 314
Spindles, 69
Spring Winders, 246
Springs, 313
Steel, 26, 149, 418, 449
Steel Stock, Ground Flat, 33
Stock Stands, 160, 268, 423
Stud Setters, 119, 337
Super Finishing Machines, 250
Surface Specimen Kits, 125

Tables, Rotary and Index, 408, 443
Tap Extractors, 325
Tapping Equipment, 29, 215, 219, 427
Tapping Machines, 178, 308, 338, 361, 370, 375
Taps, 181, 215, 243, 267
Taps, Collapsible, 30
Threading Machines, 30, 84, 111, 267, 295, 308
Tool Bits, 117
Tooling Fixtures, 173, 284
Tools, Cutting, 97, 173, 263, 266, 357, 364, 373, 449
Tools, Turning, 357
Tools, Special Cutting, 284
Tools, Threading, 256
Torq Wrenches, 56
Turrets, Lathe, 38, 135, 315, 323, 327

Valves, 12, 39, 53, 57, 61, 165, 168, 175
Vee Blocks, 382
Vises, Bench and Machine, 17, 71, 96a, 102, 146, 162, 176, 193, 210, 250, 254, 285, 272, 299, 311, 341, 361, 373, 406, 444

Welding Equipment and Supplies, 1, 18, 19, 64, 65, 160, 282, 451
Winders, Coil, 391
Wrenches, 56

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Index to Advertisers

Abart Gear & Mch. Co. 314
Aber Engineering Works 319
Accurate Bushing Company 358
Ace Abrasive Laboratories 204
Acme Diamond Tool Company 377
Acme Industrial Company 229-385
Acme Tool Company 228
Acme Wire & Iron Works 377
Acorn Bearing Company 186
Actomark Co. 410
Acro Metal Stamping Co. 91
Airway Pump & Equipment Co. 380
Alco Tool Co. 245
Allen Tool & Manufacturing Co. 283
Allison Tool & Eng. Company 108
Almond Co., T. R. 417
Alofs Mfg. Co. 188
American Cutter & Engrg. Corp. 263
American Diamond Tool & Gauge Co. 428
American Gagemakers Supply Co. 156-329
American Gauge Company 58
American Measuring Instruments Corp. 368
American Photocopy Equipment Co. 354
American Tool Works 373
Ames Co., B. C. 82
Anderson Bros. Mfg. Co. 345
Andersons, Inc. 266
Annis Co., R. B. 244
Armstrong-Blum Mfg. Co. ..... Inside Front Cover
Armstrong-Bray & Co. 190
Armstrong Bros. Tool Co. 4
Aro Equipment Corp. 32
Arter Grinding Machine Co. 20
Atlantic Gear Works 401
Atlas Press Company 133
Automatic Machine & Tool Co. 266
Auto Moulding & Mfg. Co. 369
Avey Drilling Machine Co. 16

B-H Instrument Company 334
Baldor Electric Co. 387
Bath, John 215
Baumbach Mfg. Co., E. A. 369
Bear Manufacturing Co. 344
Behr-Manning 1
Benchmaster Manufacturing Co. 114
Berkeley Equipment Co. 229
Beverly Shear Mfg. Co. 347
Black Drill Cmpany 117
Blake Co., Edward 96
Blaser Mfg. Co. 240
Blank & Buxton Machinery Co. 443
Boggis & Company, Henry P. 156
Boyar-Schultz Corp. 40
Bremil Mfg. Corp. 188
Breuer Electric Mfg. Company 369
Bridgeport Machines, Inc. 169
Brown Corp., W. R. 299
Brown Engineering Co. 268-373
Brown & Sharpe Mfg. Co. 137
Brownstein Manufacturing Co. 365
Bryant Chucking Grinder Co. 395
Buffalo Forge Co. 3
Buffalo Mchy. Co. 337
Builders Iron Foundry 242
Burgess-Manning Co. 356
Burke Machine Tool Co. 369
Burr & Son, J. T. 184
Busch Co., J. C. 349

Canedy-Otto Mfg. Co. 100
Carboloy Co., Inc. 35
Carborundum Co. 154
Cardinal Machine Co. 272
Carpenter Steel Company 418
Carroll & Jamieson Machine Tool Co. 373
Carter Products Co. 214
Center Scope Products 274
Center Tool Company 327
Central Mch. Works Co. 104
Cerro-De-Pasco Copper Corp. 248
Chandler Tool Company 270
Chicago Mfg. & Dist. Co. 73
Chicago Pneumatic Tool Co. 72
Chicago Rivet & Machine Co. 216
Chicago Screw Co. 60
Chicago Tool & Engineering Co. 250
Chicago Wheel & Mfg. Co. 194-195

Christiansen, C. B. 379
Cincinnati Electrical Tool Co. 452
Cincinnati Grinders, Inc. 9
Cincinnati Milling Machines 8
Cincinnati Shaper Company 123
Circular Tool Co. 300
Cleveland Automatic Machine Co. 213
Cleveland Twist Drill Co. 83
Clipper Belt Lacer Co. 174
Colborne Mfg. Co. 359
Colonial Broach Company 118
Columbus Die Tool & Machine Co. 315
Colwell Co., S. G. 327
Comet Tool Company 256
Commander Manufacturing Co. 378
Conant Tool & Eng. Co. 286
Cone Automatic Machine Co. 27
Conner Tool & Cutter Co. 89
Consolidated Mchy. & Supply Co., Ltd. 276
Continental Tool Works, Div. of Ex-Cello-O Corp. 110
Conway Clutch Co. 209
Cooley Electric Mfg. Corp. 287
Cooper-Bessemer Corp. 435
Coulter Machine Co., James 84
Criterion Machine Works 291-372
Crobalt, Inc. 81
Cullen-Friestedt Co. 234
Cullman Wheel Co. ..... Back Cover
Cunningham Co., M. E. 373
Curtis Universal Joint Co. 78
Cushman Chuck Company 164

Danly Machine Specialties 294
Dayton Rogers Mfg. Co. 376
Dearborn, J. W. 421
Deepfreeze Motor Products Corp. 115
Delta Manufacturing Co. 96a-96d
Denison Engineering Company 103
Desmond-Stephan Mfg. Co. 345
Detroit Die Set Corp. 261
Detroit Power Screwdriver Co. 323
Detroit Stamping Co. 148
Detroit Tap & Tool Co. 267
DeWalt Products Corp. 99
Diamond Machine Tool Co. 176
Diamond Wheel Industries 417
DoAll Company 51-52
Dolge Co., C. B. 353
Douglas Machinery Co. 29
Drafto Corporation 374
Dreis & Krump Mfg. Co. 101
Drive-All Mfg. Co. 196
Durant Manufacturing Co. 288
Durez Plastics & Chemicals, Inc. 10
Dykem Co. 365

Eagle Tool & Mch. Co. 260
Eastern Precision Gage Co. 332
Eastern Tool & Supply Co. 333
East Shore Machine Products Co. 46
Economy Mch. Products Co. 99
Economy Tool & Machine Co. 349
Eisler Engineering Co. 282
Electromatic Products Co. 289
Elgin National Watch Co. 132
Elgin Tool Works 249
Elliott Manufacturing Co. 404
Elmes Engineering Works 39
Enco Manufacturing Co. 135
Engineers' Specialties Div. 211
Errington Mechanical Laboratory 427
Esco Engineering Corp. 230
Etteo Tool Company 399
Excelsior Tool & Machine Co. 339

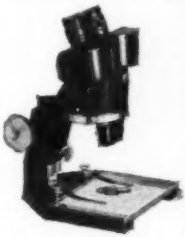
Fakes & Co., Jos. B. 310
Federal Foundry & Supply Co. 363
Federal Machine & Welder Co. 64-65
Federal Press Co. 426
Fellows Gear Shaper Co. 7
Fenn Mfg. Co. 311
Field Abrasive Specialty Mfg. Co. 190
Firth-Sterling Steel Co. 449
Fish Research & Eng. Co., J. R. 163

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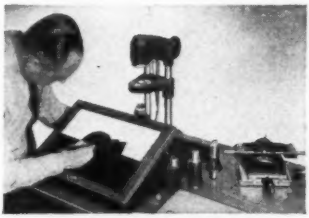
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Ford Motor Co. (Johansson Div.) 221
Fostoria Pressed Steel Corp. 56
Fulflo Specialties Co. 247
Fulmer Co., C. Allen 269

Gairing Tool Company 327
Galland-Henning Mfg. Co. 165
Gallmeyer & Livingston Co. ..... Inside Back Cover
Gardner Machine Co. 36
Gay-Lee Company 297
Gear Grinding Machine Co. 47
General Eng. & Mfg. Co. 37
Genesee Manufacturing Co., Inc. 436
Gilmore & Co., F. F. 307
Gisholt Machine Co. 11
Gits Brothers Mfg. Co. 424
Glenzer Co. J. C. 201
Gorton Machine Co., Geo. 149
Govro-Nelson Company 257
Graham Mfg. Company 254-314
Grand Specialties Co. 406
Grant Mfg. & Machine Co. 382
Gray & Prior Machine Company 403
Great Lakes Broach & Gage Co. 293
Greaves Machine Tool Co. 365-372
Greenerd Arbor Press Co. 419
Greenfield Tap & Die Corp. 181
Greenleaf Corp. (Drafto) 374
Greenley Manufacturing Co. 80
Grinders & Fixtures, Inc. 113
Grinding Company 304
Grob Brothers 294
Grobet File Co. of America 352-383
Gruen Gauge Company 370

H. & H. Research Company 241
Haleo Products Co. 284
Hall Mfg. Co. 374
Hamilton Tool Co. 158-361
Hammond Machinery Builders 312-326
Hardee Spring & Mfg. Co. 313
Handy & Harman 85
Hansen Manufacturing Co. 171
Hanson Clutch & Mchy. Co. 259
Hardinge Brothers, Inc. 3-98
Hart Machine Company 348
Hartford Special Machinery Company 134
Harvey Mfg. Corp. 427
Haskins Co., R. G. 397
Heimann Mfg. Co. 246
Heller Brothers Co. 93
Herkimer Tool & Model Works 342
Hermann Stoop Company 439
Hevi-Duty Electric Company 22
Hilliard Corp. 355
Hobart Brothers Co. 1
Hotel Hollenden 258
Howe & Son, Inc. 315
Hull Tool & Manufacturing Co. 281
Humm Safety Equipment Co., John 318
Hunt & Son, C. B. 53
Hypro Tool Company 243

Ideal Com. Dresser Co. 14-23
Independent Pneumatic Tool Co. 76
Industrial Products Suppliers 361
Industry Tools, Inc. 296
Ingersoll-Rand 88

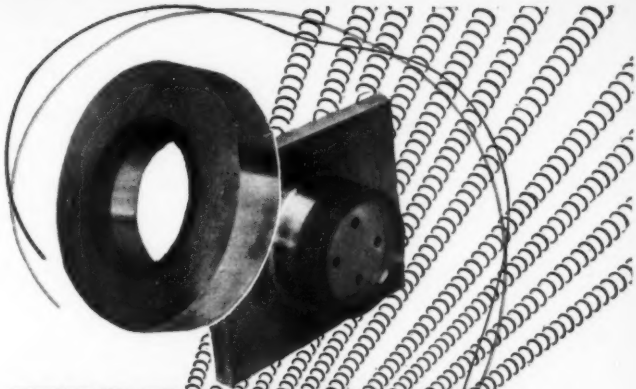
J. & S. Tool Co. 325-329
Jacobs Manufacturing Co. 24-25
Janette Mfg. Co. 348
Jarvis Co., Chas. L. 15
Jefferson Eng. & Mfg. Co. 378
Jefferson Machine Tool Co. 315
Jessop Steel Company 26
Johansson Div. (Ford Motor Co.) 221
Johnson Gas Appliance Co. 350
Johnson Machine & Press Corp. 421
Johnson Tool Co. 292
Jones & Lamson Machine Co. 21

Kandler Co., John E. 292
Kearney & Trecker Products Corp. 143
Kennametal, Inc. 41
Knight Machry. Co., W. B. 157
Knu-Vise, Inc. 94
Koebel Diamond Tool Co. 244

L. & J. Press Corp. 351
L-W Chuck Co. 193
Lambert Products 250
La Salle Tool Co. 419
Lassy Tool Company 178
LeBlond Machine Tool Co., R. K. 441
Leckinger Machine & Experimental Co. 338
Lee Co., K. O. 437
Lehmann Mch. Co. 13
Lenox Instrument Co. 306
Lewthwaite Machine Co., T. H. 367
Libert Machine Company 321
Lima Electric Motor Co. 275
Lincoln Electric Company 18-19
Lincoln Park Industries, Inc. ..... Front Cover
Linley Brothers Co. 429
Littell Machine Co., F. J. 367
Logan Engineering Co. 179
Logansport Machine Company 175
Lovejoy Flex. Coupling Co. 290
Lucas Mach. Co., J. L. 284
Luma Electric Equipment Co. 367
Lyon-Raymond Corp. 384

M. B. Products 377
McGill Manufacturing Co. 422
McMahon Co., Frank 365
Machine Products Corp. 225
Madco Products, Inc. 392
Madison-Kipp Corp. 396
Madison Manufacturing Co. 271
Majestic Tool & Mfg. Co. 240
Mall Tool Company 237
Maple City Stamping Co. 433
Maquoketa Company 425
Martin Engineering Co. 48
Marton Equipment Co. (Smallpeice) 168
Marvel Tool & Mch. Co. 52
Master Manufacturing Co. 235
Maxwell Co., F. A. 279
Meaf Specialties Co. 130-405
Meinhardt Diamond Tool Co. 158
Melling Tool Company 295
Mercury Metal Die & Letter Co. 68
Metal Cutting Tools & Mfg. Co. 357
Metro-Vise Company 210
Meyers Co., W. F. 191
Michigan Chrome & Chemical Co. 400
Michigan Drill Head Co. 183-371
Midwest Tool & Eng. Co. 371
Miller-Knuth Mfg. Co. 363
Milwaukee Chaplet & Mfg. Co. 362
Minn-Kota Mfg. Co. 315
Modern Motor Drives Div. (Nichols Eng. Co.) 162
Modern Tool Works 119
Molina Ind. Diamond Co. of U. S. 236
Monarch Machine Tool Co. 151
Mooney Special Tool Co. 422
Morey Machinery Co., Inc. 231
Motch & Merryweather Mchy. Co. 34
Motor Tool Mfg. Co. 239
Mummert-Dixon Company 288
Murchey Mch. and Tool Co. 30
Murphy & Co., James A. 367
Murray Manufacturing Co., D. J. 360

National Acme Co. 111
National Machine Tool Co. 319
Nedco Co. 363
Nelco Tool Co. 277
Neubert Machine Company 357
New Albany Machine Mfg. Co. 207
New Britain Tool & Mfg. Co. 361
New-Field Machined Parts Co. 273
New Method Steel Stamps, Inc. 271
New Plastic Corp. 280
Nichols Eng. Co. (Modern Motor Drives) 162
Nicholson & Co., W. H. 278
Nicholson File Co. 161-189
Nielsen, Inc. 351
Nielsen Tool & Die Co. 188
Nilson Machine Co. A. H. 337
Norgren Co., C. A. 12
Norton Company 54-55
Numberall Stamp & Tool Co. 336



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O'Neil-Irwin Manufacturing Co. 309

Paasche Airbrush Company 162
Paddock Tool Co. 335
Park Metal Products 402
Passman Brothers 406
Peninsular Chemical Products Co. 340
Phillips Mfg. Co. 317
Plunket Machine Co., J. E. 146
Plymouth Engineering Co. 331
Pope Machinery Corp. 69
Porst Brothers 394
Porter-Cable Machine Co. 129
Porter Machine Co. 410
Potter & Johnston Mch. Co. 173
Pratt & Whitney 166
Printz Electric Company 160
Procunier Safety Chuck Co. 219
Production Instrument Company 391
Production Machine Co. 318
Producto Machine Co. 102
Products Engineering Co. 410
Prutton Machine & Tool Co., D. H. 308
Putnam Tool Co. 105
Pyrometer Instrument Co. 186

Quality Tool & Die Co. 445

Racine Tool & Machine Co. 61
Rahn Granite Surface Plate Co. 333
Reading Machine Co. 180
Reagan Company 326
Reconstruction Finance Corp. 262
Reich Mfg. Co., J. R. 184
Reid Brothers Co. 255
Republic Drill & Tool Co. 411
Richards Co., J. A. 265
Riley & Geehr, Inc. 386
Rivett Lathe & Grinder, Inc. 2
Robbins Eng. Co. 393
Rockford Clutch Division 288
Rogers & Co., Sam'l. C. 388
Rogers Mch. Works, Inc. 438
Roofe Machine Works 298
Ross Operating Valve Co. 57
Rotary File Co. 77
Rotor Tool Co. 109
Rouse & Co., H. B. 346
Rusnok Tool Works 339
Ryerson & Son, Inc., Jos. T. 140

S & S Machine Works 377
Sales Service Machine Tool Co. 203
San Angelo Foundry & Mchry. Co. 351
Sand-O-Flex Corp. 363
Sanford Manufacturing Co. 224
Saw-Way Industries 125
Schaffer Company, S. S. 223
Schauer Machine Co. 148
Scherr Co., George 447
Schmarje Tool & Engineering Co. 150
Schmidt, Inc., Geo. T. 331
Scientific Div. (Acme Ind. Co.) 385
Scientific Lubricants Co. 246
Seneca Falls Machine Co. 38
Sentry Company 106
Severance Tool Industries, Inc. 347
Sheffield Corp. 185
Sheldon Machine Co. 343
Sid Tool Company 220
Sigourney Tool Co. 420
Simonds Saw & Steel Company 33
Size Control Company 389
Skilsaw, Inc. 5
Smallpeice, Ltd. 168
Smith Tool & Eng. Co. 347
Sossner 353
South Bend Lathe Works 139
Spline & Gear Machine Co. 361
Springfield Machine Tool Co. 124
Square Surface Plate & Tool Co. 429
Stackbin Corporation 423
Stadoil Manufacturing Co. 255
Standard Gage Company 75
Standard Machinery Co. 59
Standard Thread Gage Company 152
Standard Transmission Equipment Co. 188
Stanley Works 120
Staples Tool & Eng. Co. 87
Stark Tool Company 366
Starrett Co., L. S. 177
Steege Machinery Co., W. L. 351
Sterling Grinding Wheel Div. 187
Stokerunit Corp. 145
Stow Manufacturing Co. 205
Strand & Company, N. A. 303
Strand Manufacturing Co. 398
Sturdimatic Tool Co. 112
Sturtevant Co., P. A. 56
Sun Oil Co. 153
Sundstrand Machine Tool Co. 251
Sunnen Products Co. 92
Super Sales & Engineering Co. 329
Super Tool Company 90
Sutton Tool Company 264
Syntron Company 321

T. & H. Mfg. Co. 184-226
Tamms Silica Company 381
Tannewitz Works 42
Tatra Tool Company 256
Taylor Company, R. A. 364
Taylor & Fenn Company 390
Taylor Mch. Co. 371
Thriftmaster Products 43
Timesaver Products Co. 322
Tool Specialties Co. 375
Tomkins-Johnson Co. 182
Torit Manufacturing Co. 253
Torq Electric Mfg. Co. 86
Trico Products Corp. 355
Trindl Products, Ltd. 451
Triplex Machine Tool Corp. 375
Troyke, Alfred A. 408
Turchan Fellower Mch. Co. 388
Turner Machine Company 305

U. S. Electrical Tool Co. 198
U. S. Hoffman Mchy. Corp. 50
U. S. Machine Tool Mfg. Corp. 381
Unique Manufacturing Co. 323
United Precision Products Co. 416
Universal Engineering Co. 70-71
Universal Engineering Co. (Cal.) 226
Upton Electric Furnace Div. 49

Van Keuren Company 159
Van Tuyl Eng. Corp. 95
Victor Machinery Exchange 430-431-432
Vimco Manufacturing Co. 286
Vinco Corp. 17
Vonnegut Moulder Corp. 385

Wade Instrument Co. 186
Wade Tool Co. 126
Waldes Kohinoor, Inc. 63
Walker-Turner Co. 131
Walls Sales Corporation 382
Walton Company 325
Wardwell Mfg. Co. 252
Warren City Mfg. Co. 171
Weber Machine Corp. 423
Weldex, Inc. 160
Wesche Electric Co., B. A. 44
Wesson Products Co. 444
Western Tool & Mfg. Co. 408
Wheel Truing Tool Co. 107
White Dental Mfg. Co., S. S. 147
Whitney Metal Tool Co. 392
Wiedemann Machine Co. 116
Willey's Carbide Tool Co. 317
Wilson, K. R. 197
Wilson Mechanical Instrument Co. 218
Wirth & Son, Carl 288
Wittek Mfg. Co. 128
Woodworth Co., N. A. 79
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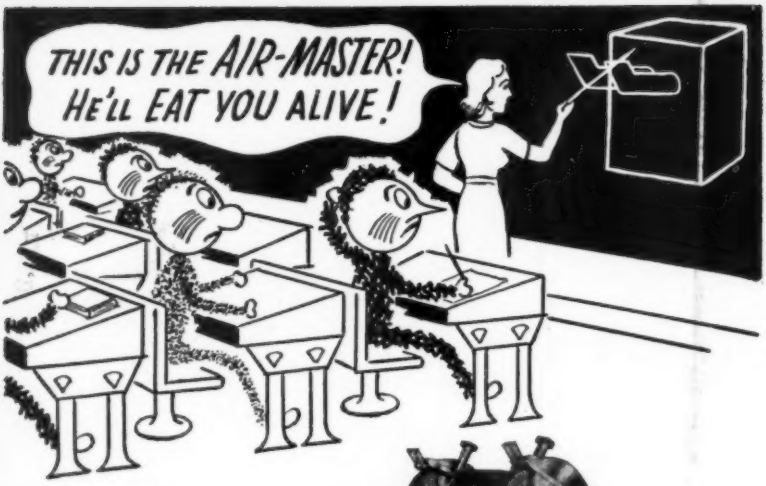
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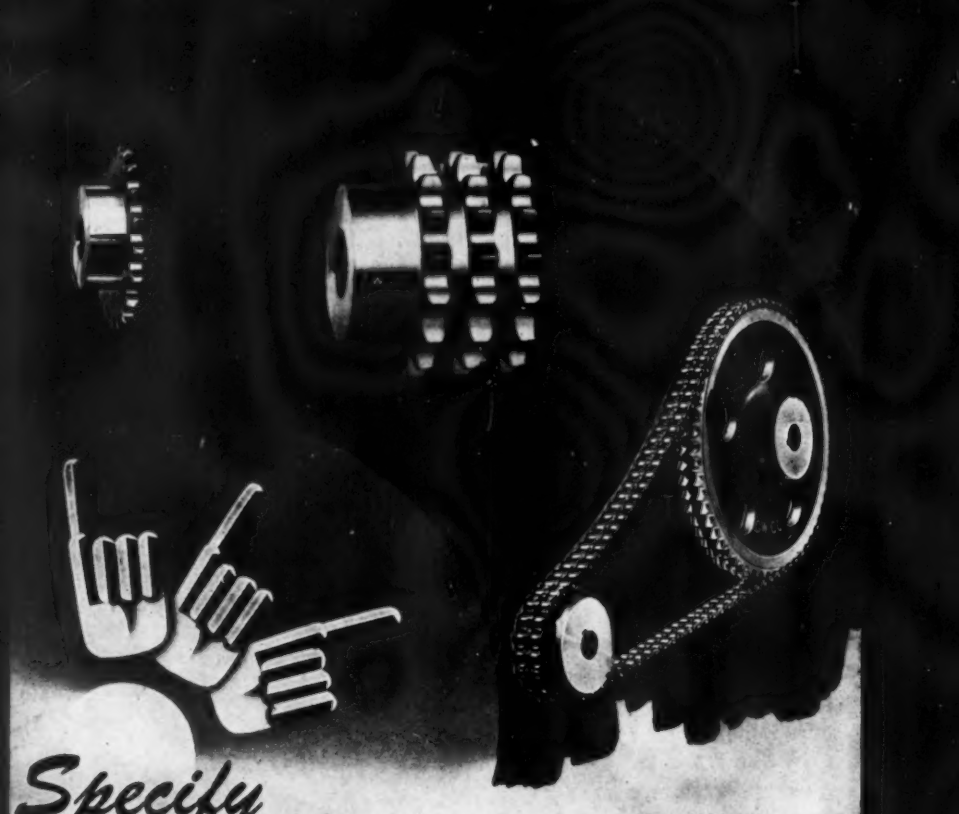
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